IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

GLAXOSMITHKLINE BIOLOGICALS SA AND GLAXOSMITHKLINE LLC, Plaintiffs, v. PFIZER INC., PHARMACIA & UPJOHN CO. LLC, BIONTECH SE, BIONTECH MANUFACTURING GMBH, and BIONTECH US INC., Defendants.	)	C.A. No. **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiffs GlaxoSmithKline Biologicals SA ("GSK Biologicals") and GlaxoSmithKline LLC ("GSK LLC") (collectively, "GSK"), by their attorneys for this Complaint against Defendants Pfizer Inc. and Pharmacia & Upjohn Co. LLC (collectively, "Pfizer"), and BioNTech SE, BioNTech Manufacturing GMBH, and BioNTech US Inc. (collectively, "BioNTech"), allege as follows:

INTRODUCTION

1. GSK Biologicals researches, develops, and manufactures innovative vaccines and specialty medicines to serve patients and healthcare professionals worldwide. GSK Biologicals is the sole owner and assignee of numerous United States patents directed to formulations comprising lipids and messenger ribonucleic acid ("mRNA") molecules encoding an immunogen, and methods of administering the same. *See* Exhibits 1–5 (the "Patents-in-Suit," as defined in paragraph 9, below).

2. In 2008, more than a decade before the SARS-CoV-2 (2019) coronavirus disease (COVID-19) pandemic, Andrew Geall, an accomplished formulation scientist and the named

inventor of the Patents-in-Suit, joined a team of talented researchers working under the leadership of vaccinologist Christian Mandl (the "Mandl team") focused on developing mRNA vaccines. These individuals discovered formulations comprising lipids and mRNA molecules encoding a viral immunogen that provide protection from viral infection. The Mandl team described the inventions now claimed in the Patents-in-Suit, in patent applications filed in 2010.

3. The Mandl team's innovation has been revolutionary for vaccine development. A significant advantage over other approaches to vaccine design is the ability to employ the technology as a platform to formulate and administer mRNA encoding a wide range of immunogens. The prestigious science journal *Nature* noted in 2021 that "[e]very mRNA company now uses some variation of [the Mandl team's] delivery platform and manufacturing system[.]" Exhibit 6 (Dolgin, "The Tangled History of mRNA Vaccines," *Nature* 597, 318 (2021)) at 323.

4. Another major advance of the Mandl team's inventions over preexisting vaccine technologies is the speed with which a new vaccine candidate can be made and tested. Indeed, in response to the 2013 influenza outbreak in China, the Mandl team created a new mRNA vaccine candidate in just eight days—"in real time the moment that sequence was available." Exhibit 7 (Dolgin, "Injection of Hope," *Nature* 574, S10 (2019)) at S11. *Nature* recognized this achievement as "[t]he current speed record" of vaccine development. *Id*.

5. The foundation of Defendants' technical and financial success with COVID-19 vaccines is the technology of GSK's patented inventions. Defendants have repeatedly touted the speed at which they produced their original COVID-19 vaccine and were later able to modify it to address new viral strains but have consistently failed to acknowledge how they applied the Mandl team's revolutionary platform to do so. Defendants have reaped billions of dollars in revenue from infringing GSK's Patents-in-Suit and continue to benefit, without ever obtaining a license.

6. GSK brings this suit to recover a reasonable royalty for Defendants' infringing sales of mRNA vaccines that apply the Mandl team's inventions.

NATURE OF THE ACTION

7. GSK incorporates by reference paragraphs 1–6.

8. This is a civil action for patent infringement arising under the patent laws of the United States, 35 U.S.C. § 100 *et seq*., seeking damages for Defendants' infringing manufacture, use, sale, marketing, offer for sale, and/or importation of its following products (as defined in paragraphs 47–66, below): (1) the original "monovalent" (containing a single mRNA active ingredient) Comirnaty® COVID-19 vaccine; (2) the "bivalent" (containing two different mRNA active ingredients) Comirnaty® COVID-19 original plus BA.1 variant vaccine; (3) the bivalent Comirnaty® COVID-19 original plus BA.4/5 variant vaccine; and (4) the monovalent Comirnaty® COVID-19 XBB.1.5 variant vaccine (collectively, the "Accused Products" or "Defendants' COVID-19 vaccines").

9. As alleged herein, Defendants' manufacture, use, sale, marketing, offer for sale, and/or importation of the Accused Products directly infringed and continues to directly infringe, actively induced and continues to actively induce infringement of, and/or contributed to and continues to contribute to the infringement of, one or more claims of the following GSK Biologicals patents directed to mRNA vaccine technology: U.S. Patent Nos. 11,638,693 (the "'693 patent") (Exhibit 1), 11,638,694 (the "'694 patent") (Exhibit 2), 11,666,534 (the "'534 patent") (Exhibit 3), 11,766,401 (the "'401 patent") (Exhibit 4), and 11,786,467 (the "'467 patent") (Exhibit 5) (collectively, the "Asserted Patents" or "Patents-in-Suit"). At all relevant times, GSK Biologicals has lawfully owned, and continues to lawfully own, all rights, title, and interest in the Patents-in-Suit, including the right to sue and recover for past infringement.

THE PARTIES

10. GSK incorporates by reference paragraphs 1–9.

11. Plaintiff GSK Biologicals is a corporation organized and existing under the laws of Belgium, with its principal place of business at Avenue Fleming 20, 1300 Wavre, Belgium. GSK Biologicals is the owner of all patents asserted in this litigation.

12. Plaintiff GSK LLC is a limited liability corporation organized and existing under the laws of Delaware, with its principal place of business at 2929 Walnut Street, Suite 1700, Philadelphia, PA 19104. GSK LLC produces and distributes pharmaceutical products. GSK Biologicals has designated GSK LLC as the exclusive distributor of any products covered by the Patents-in-Suit in the United States.

13. On information and belief, Defendant Pfizer Inc. is a corporation organized and existing under the laws of Delaware, with its principal place of business at 66 Hudson Boulevard East, New York, New York 10001. Pfizer Inc., itself and through its subsidiaries and business partners, develops, manufactures, imports, markets, distributes, offers to sell, and/or sells the Accused Products and other medicines in the State of Delaware and throughout the United States, for use in the State of Delaware and throughout the United States.

14. On information and belief, Defendant Pharmacia & Upjohn Co. LLC is a wholly owned subsidiary of Pfizer Inc. Pharmacia & Upjohn Co. LLC is a company organized and existing under the laws of Delaware with its principal place of business at 100 Route 206 N, Peapack, New Jersey 07977. On information and belief, Pharmacia & Upjohn Co. LLC manufactures, labels, and packages the Accused Products in facilities located at 7000 Portage Road, Kalamazoo, Michigan 49001. Exhibit 8 (August 23, 2021, FDA Comirnaty® (original monovalent) COVID-19 vaccine Approval Letter) at 1.

15. On information and belief, Defendant BioNTech SE is a corporation organized and existing under the laws of Germany, with its principal place of business at An der Goldgrube 12, 55131 Mainz, Germany.

16. On information and belief, Defendant BioNTech Manufacturing GmbH, a wholly owned subsidiary of BioNTech SE, is a limited liability company organized and existing under the laws of Germany, with its principal place of business at An der Goldgrube 12, 55131 Mainz, Germany, and is the Biologics License Application ("BLA") holder for the Accused Products in the United States. Exhibit 8 (August 23, 2021, FDA Comirnaty® (original monovalent) vaccine Approval Letter); *see also ModernaTX, Inc. v. Pfizer Inc.*, No. 1:22-CV-11378, D.I. 45 at 20 (D. Mass. Dec. 5, 2022).

17. On information and belief, Defendant BioNTech US Inc., a wholly owned subsidiary of BioNTech SE, is a corporation organized and existing under the laws of Delaware, has its principal place of business at 40 Erie St., Suite 110, Cambridge, MA 02139, serves as the North American Headquarters for BioNTech SE,[1] and is BioNTech SE's agent for service of process in the United States. Exhibit 9 (excerpts from March 30, 2022, BioNTech SE 2021FY Annual Report (Form 20-F)), at 81; *see also ModernaTX, Inc. v. Pfizer Inc.*, No. 1:22-CV-11378, D.I. 45 at 21 (D. Mass. Dec. 5, 2022).

18. On information and belief, Defendants are agents of one another or work in concert with each other regarding the development, regulatory approval, manufacturing, marketing, offering for sale, sale, or distribution of the Accused Products in the United States. *See ModernaTX, Inc. v. Pfizer Inc.*, No. 1:22-CV-11378, D.I. 45 at 21 (D. Mass. Dec. 5, 2022).

[1] *See* www.biontech.com/int/en/home/about/biontech-us-website.html, last visited April 20, 2024.

JURISDICTION AND VENUE

19. GSK incorporates by reference paragraphs 1–18.

20. This action arises under the patent laws of the United States, including 35 U.S.C. § 100 *et seq*. generally, and 35 U.S.C. § 271 *et seq*. specifically.

21. This Court has jurisdiction over the subject matter of this action under 28 U.S.C. §§ 1331 and 1338(a).

22. This Court has personal jurisdiction over Defendants Pfizer Inc., Pharmacia & Upjohn Co. LLC, and BioNTech US, Inc. because each is organized under the laws of Delaware.

23. This Court also has personal jurisdiction over Defendants Pfizer Inc., Pharmacia & Upjohn Co. LLC, BioNTech SE, BioNTech Manufacturing GmbH, and BioNTech US Inc. because, on information and belief, each has conducted and continues to conduct business in Delaware at least by offering for sale or selling the Accused Products in Delaware, and because each has committed and continues to commit acts of infringement in Delaware. For example, as reported by the United States Center for Disease Control and Prevention ("CDC"), by May 10, 2023, Defendants had delivered to the State of Delaware over 1.65 million doses of Comirnaty® (original monovalent) COVID-19 vaccine and over 300 thousand doses of Comirnaty® (bivalent BA.4/5) (both products as defined in paragraphs 47–66, below). Exhibit 10 (printout of CDC Data on Comirnaty® (original monovalent and bivalent BA.4/5) doses distributed in Delaware, May 10, 2023).[2] On information and belief, Defendants continue to deliver doses of Comirnaty® COVID-19 vaccine products to the State of Delaware. Therefore, Defendants Pfizer Inc., Pharmacia & Upjohn Co. LLC, BioNTech SE, BioNTech Manufacturing GmbH, and BioNTech

[2] Spreadsheet available at https://data.cdc.gov/Vaccinations/COVID-19-Vaccinations-in-the-United-States-Jurisdi/unsk-b7fc/data_preview; Delaware specific data last accessed, April 10, 2024.

US, Inc. have transacted and continue to transact business within Delaware relating to GSK's claims and have engaged in and maintain systematic and continuous business contacts in Delaware.

24. Defendants Pfizer Inc., Pharmacia & Upjohn Co. LLC, BioNTech SE, and BioNTech Manufacturing GmbH have consented to this Court's exercise of personal jurisdiction in other litigations involving the Accused Products, including in *Alnylam Pharmaceuticals, Inc. v. Pfizer Inc., et al*, C.A. No. 22-cv-336-CFC and *Alnylam Pharmaceuticals, Inc. v. Pfizer Inc., et al*, C.A. No. 23-cv-578-CFC.

25. Venue is proper in this judicial District with respect to Defendants Pfizer Inc., Pharmacia & Upjohn Co. LLC, and BioNTech US Inc. pursuant to 28 U.S.C. § 1400(b) because Pfizer Inc., Pharmacia & Upjohn Co. LLC, and BioNTech US, Inc. are entities organized and existing under the laws of the State of Delaware and reside in Delaware for purposes of venue.

26. Venue is proper in this District with respect to BioNTech SE and BioNTech Manufacturing GmbH under 28 U.S.C. § 1391(c)(3) because BioNTech SE and BioNTech Manufacturing GmbH are not residents of the United States.

27. Defendants Pfizer Inc., Pharmacia & Upjohn Co. LLC, BioNTech SE, and BioNTech Manufacturing GmbH have consented to this Court as a proper venue in other litigations involving the Accused Products, including in *Alnylam Pharmaceuticals, Inc. v. Pfizer Inc., et al*, C.A. No. 22-cv-336-CFC and *Alnylam Pharmaceuticals, Inc. v. Pfizer Inc., et al*, C.A. No. 23-cv-578-CFC.

BACKGROUND

28. GSK incorporates by reference paragraphs 1–27.

A. The Claimed Inventions

29. By 2008, there were many well-understood and significant hurdles to employing mRNA in vaccines. *See* Exhibit 6 (Dolgin, "The Tangled History of mRNA Vaccines," *Nature* 597, 318 (2021)) at 320 ("In the 1990s and for most of the 2000s, nearly every vaccine company that considered working on mRNA opted to invest its resources elsewhere.").

30. In conventional vaccines, a protein is administered to a patient, is recognized as foreign by the body, and triggers the patient's immune response (hence the protein is an "immunogen"). With mRNA vaccines, mRNA that encodes for an immunogenic protein is administered to a patient. If the mRNA can reach the inside of a patient's cells, existing cellular machinery will read instructions encoded by the mRNA to make the protein—a process called "translation"—which then triggers the immune response.

31. But getting mRNA molecules, intact, from where they are made in the laboratory into a patient's cell had historically presented seemingly insurmountable challenges. For example, mRNA is chemically fragile—it can degrade quickly even in a controlled laboratory environment. It needs to be protected from the moment of preparation through formulation, storage, handling, administration, and even inside the body following administration. And even if the mRNA remains intact following administration to a patient, the mRNA still needs some way to get into the cell so it can be translated and the immunogenic protein can effectuate an immune response.

32. Despite unsuccessful efforts by others dating back decades, a talented team of researchers led by Christian Mandl set out in 2008 to overcome these hurdles and develop vaccines using mRNA. Exhibit 6 (Dolgin, "The Tangled History of mRNA Vaccines," *Nature* 597, 318 (2021)) at 323. Through extensive experimentation, perseverance, and the unique insights and preferences of these talented scientists, the Mandl team successfully overcame the many

challenges and discovered the novel lipid and mRNA formulations and methods for their use to raise an immune response against immunogens that are described and claimed in the Patents-in-Suit.

33. The Mandl team's seminal publication on this work has been cited over 500 times and viewed over 60,000 times. *See* Exhibit 11 (Geall *et al*., "Nonviral delivery of self-amplifying RNA vaccines," *Proc. Natl. Acad. Sci.* 109(36), 14604-609 (2012) with supplementary information).[3] In a 2022 presentation for healthcare professionals concerning its COVID-19 vaccines entitled "Overview of mRNA vaccine development," Pfizer cited this Mandl team publication for the statement: "Lipid nanoparticles were developed to protect the mRNA strands that encode the spike protein from degradation, thus helping them reach their target cells." Exhibit 12 (Pfizer "Overview of mRNA vaccine development" presentation, dated August 2022[4]).

34. The United States government immediately recognized the value of the Mandl team's work. In the wake of the 2009 H1N1 flu pandemic virus outbreak, the Defense Advanced Research Projects Agency ("DARPA") awarded a contract to fund further research and development by the Mandl team into mRNA vaccine technology for quick deployment in response to new pandemic threats. Exhibit 13 (Lizotte, "Novartis Receives $14M Award from DARPA," Global Biodefense, January 31, 2012) (describing award of DARPA Contract HR0011-12-3-0001).

35. This robust platform has proven suitable for obtaining an immune response from a wide range of immunogen-encoding mRNA molecules, manifest through its adoption by "[e]very

[3] Metrics available at https://www.pnas.org/doi/full/10.1073/pnas.1209367109.
[4] Available at https://covid19.pfizerpro.com/api/vc/en/content/material/561b4c91-800b-4ec0-af5c-efddf0aead8c/COVID19_PP-CVV-USA-0984_1.pdf?download=true; preserved April 10, 2024.

mRNA company." Exhibit 6 (Dolgin, "The Tangled History of mRNA Vaccines," *Nature* 597, 318 (2021)) at 323.

B. GSK Biologicals's Acquisition of the Mandl Team's Inventions

36. At the time the Mandl team began working on mRNA vaccines, they were employed by Novartis AG subsidiaries. In 2015, GSK Biologicals acquired a substantial portion of Novartis AG's global vaccines business. *See* Exhibit 14 (March 2, 2015, GSK press release).

37. In that transaction, GSK Biologicals obtained, among other things, the Mandl team's inventions, including all rights to the parent applications to the Patents-in-Suit and progeny, including the Patents-in-Suit.

C. Defendants' Use and Knowledge of the Mandl Team's Patented Technology

38. Defendants were aware of the Mandl team's mRNA vaccine innovations long before they ever developed and commercialized the Accused Products.

39. Indeed, years before marketing the Accused Products, Defendants hired former Novartis AG vaccines business employees who had first-hand knowledge of the Mandl team's innovations.

40. Since at least 2013, publications on the Mandl team's mRNA vaccine work have been identified by patent examining authorities as relevant prior art to BioNTech's own patent applications. This art includes published predecessor applications to the Patents-in-Suit. *See*, *e.g.*, Exhibit 15 (June 14, 2013, Written Opinion of the International Searching Authority on application PCT/EP2013/000902). BioNTech has also cited the Mandl team's patent application publications within the text of its own patent applications since at least 2016. *See*, *e.g.*, Exhibit 16 (excerpts from International PCT Application Publication Number WO2017/162266 of International PCT Application Number PCT/EP2016/056165, filed March 21, 2016). *See also* Exhibit 17 (printout

of patent filings and patent applicants citing to patents or patent applications in the family of the Patents-in-Suit from the Derwent Patents Citation Index, preserved April 19, 2024).[5]

41. BioNTech's familiarity with the families of patent applications describing and claiming the Mandl team's work prior to and during the COVID-19 pandemic is also evidenced by various communications between GSK and BioNTech.

42. And as noted, Pfizer recognized the contributions of the Mandl team in at least one presentation posted on its website concerning the development of its COVID-19 vaccines. Exhibit 12 (Pfizer "Overview of mRNA vaccine development" presentation, dated August 2022).

43. Defendants' COVID-19 mRNA vaccines exploit the fundamental technologies invented by the Mandl team and claimed in the Patents-in-Suit. Defendants leveraged their knowledge of the Mandl team's work to design and develop the Accused Products. But Defendants did not acquire a license to practice the GSK inventions before or since commercializing the Accused Products.

44. Defendants have had knowledge of and specific notice of their infringement of the Patents-in-Suit by the manufacture and sale of the Accused Products at least since April 24, 2024, as evidenced by communications with GSK. *See* Exhibits 81-82.

45. Defendants continue to infringe the Patents-in-Suit through the manufacture and sale of the Accused Products.

DEFENDANTS' INFRINGING ACTIVITIES

46. GSK incorporates by reference paragraphs 1–45.

[5] Information on the Derwent Patents Citation Index is available at https://clarivate.com/products/ip-intelligence/ip-data-and-apis/derwent-patents-citation-index/. Similar information is available publicly through Google Patents. *See*, *e.g.*, Exhibit 18 (Google Patents, Cited By section, for the '534 patent, available at https://patents.google.com/patent/US11666534B2/en?oq=+11%2c666%2c534; preserved August 3, 2023).

A. The Accused Products

47. Defendants' manufacture, use, sale, marketing, offer for sale, and/or importation of the following Accused Products infringe the Patents-in-Suit: all dosage forms of (1) the original monovalent Comirnaty® COVID-19 vaccine ("Comirnaty® (original monovalent)"); (2) the bivalent Comirnaty® COVID-19 original plus BA.1 variant vaccine ("Comirnaty® (bivalent BA.1)"); (3) the bivalent Comirnaty® COVID-19 original plus BA.4/5 variant vaccine ("Comirnaty® (bivalent BA.4/5)"); and (4) the monovalent Comirnaty® COVID-19 XBB.1.5 variant vaccine ("Comirnaty® (monovalent XBB.1.5)").

48. On information and belief, for each of the foregoing Accused Products, Defendants previously used and continue to use the same method of manufacture, composition of mRNA drug substance (apart from differences in the sequence encoding the immunogens), and composition of drug product when applying for regulatory authorization or approval by the Food and Drug Administration ("FDA") in the United States and European Medicines Agency ("EMA") in Europe.

49. Defendants, FDA and EMA have also referred to the Accused Products as "BNT162b2" vaccine products. *See*, *e.g.*, Exhibit 19 (December 10, 2022, Pfizer press release); Exhibit 20 (December 11, 2020, FDA Comirnaty® (original monovalent) Emergency Use Authorization ("EUA") Review Memo); Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report).

50. Comirnaty® (original monovalent) includes the active substance "tozinameran," mRNA encoding a spike protein of the original (2019) strain of the SARS-CoV-2 coronavirus. *See*, *e.g.*, Exhibit 22 (December 15, 2023, EMA Comirnaty® European Public Assessment Report ("EPAR") Product Information) at 2 ("Tozinameran is a single-stranded, 5'-capped messenger RNA (mRNA) … encoding the viral spike (S) protein of SARS-CoV-2.") and 79 (referring to the

viral strain as "SARS-CoV-2 (Original))"; Exhibit 23 (Proposed International Nonproprietary Names List 124 – COVID-19) at 666.

51. The tozinameran mRNA active ingredient includes, among other things, a 5' cap, a 5' untranslated region (UTR), an open reading frame region coding for the spike protein, a 3' untranslated region, and a 3' polyA tail. *See*, *e.g.*, Exhibit 22 (December 15, 2023, EMA Comirnaty® EPAR Product Information) at 2; Exhibit 23 (Proposed International Nonproprietary Names List 124 – COVID-19) at 666.

52. Comirnaty® (original monovalent) elicits an immune response to the viral spike protein of the original (2019) strain of SARS-CoV-2 coronavirus. *See*, *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 13; Exhibit 22 (December 15, 2023, EMA Comirnaty® EPAR Product Information) at 8–16.

53. In response to the emergence of new strains of SARS-CoV-2, Defendants advanced dosage forms of two bivalent vaccines for commercial marketing authorization or approval: the Comirnaty® (bivalent BA.1) vaccine; and the Comirnaty® (bivalent BA.4/5) vaccine. *See*, *e.g.*, Exhibit 24 (September 1, 2022, Pfizer press release) (reporting on Comirnaty® (bivalent BA.1); Exhibit 25 (November 4, 2022, Pfizer press release) (reporting on Comirnaty® (bivalent BA.4/5).

54. Both the Comirnaty® (bivalent BA.1) and Comirnaty® (bivalent BA.4/5) vaccines contain the tozinameran mRNA active substance. *See*, *e.g.*, Exhibit 22 (December 15, 2023, EMA Comirnaty® EPAR Product Information) at 79, 98; Exhibit 26 (December 7, 2022, EMA Comirnaty® (bivalent BA.1) Assessment Report) at 6 ("The active substance tozinameran is already approved in the existing Comirnaty conditional marketing authorization. No changes to the information related to tozinameran are proposed."); Exhibit 24 (September 1, 2022, Pfizer press release) ("Apart from the addition of the mRNA sequence of the Omicron BA.1 spike

protein, all other components of the vaccine remain unchanged."); Exhibit 27 (September 12, 2022, EMA Comirnaty® (bivalent BA.4/5) Assessment Report) at 5 ("The active substance tozinameran is already approved for the original Comirnaty vaccine formulations (EU/1/20/1528/001-005). No changes to the information related to tozinameran are proposed."); Exhibit 25 (November 4, 2022, Pfizer press release) ("Apart from the addition of the mRNA sequence of the Omicron BA.4/BA.5 spike protein, all other components of the vaccine remain unchanged.").

55. In addition to tozinameran, the Comirnaty® (bivalent BA.1) vaccine also contains the active substance "riltozinameran," mRNA encoding a viral spike protein of the Omicron BA.1 variant of SARS-CoV-2. Exhibit 22 (December 15, 2023, EMA Comirnaty® EPAR Product Information) at 79 ("Riltozinameran is a single-stranded, 5'-capped messenger RNA (mRNA) … encoding the viral spike (S) protein of SARS-CoV-2 (Omicron BA.1)."); Exhibit 26 (December 7, 2022, EMA Comirnaty® (bivalent BA.1) Assessment Report) at 6; Exhibit 28 (Proposed International Nonproprietary Names List 126 – COVID-19 Addendum) at 1147.

56. On information and belief, apart from the open reading frame region coding for a viral spike protein of the SARS-CoV-2 Omicron BA.1 coronavirus variant, the components of the riltozinameran mRNA active ingredient are unchanged as compared to the tozinameran mRNA active ingredient as set forth above in paragraph 51. *See*, *e.g.*, Exhibit 22 (December 15, 2023, EMA Comirnaty® EPAR Product Information) at 79; Exhibit 28 (Proposed International Nonproprietary Names List 126 – COVID-19 Addendum) at 1147.

57. The Comirnaty® (bivalent BA.1) vaccine product elicits an immune response to the spike proteins of both the original SARS-CoV-2 strain and Omicron BA.1 SARS-CoV-2 variant. *See*, *e.g.*, Exhibit 22 (December 15, 2023, EMA Comirnaty® EPAR Product Information)

at 86–94; Exhibit 26 (December 7, 2022, EMA Comirnaty® (bivalent BA.1) Assessment Report) at 62-66.

58. In addition to tozinameran, the Comirnaty® (bivalent BA.4/5) vaccine also contains the active substance "famtozinameran," mRNA encoding a viral spike protein of the Omicron BA.4/5 variant of SARS-CoV-2. Exhibit 22 (December 15, 2023, EMA Comirnaty® EPAR Product Information) at 98 ("Famtozinameran is a single-stranded, 5'-capped messenger RNA (mRNA) … encoding the viral spike (S) protein of SARS-CoV-2 (Omicron BA.4-5)."); Exhibit 27 (September 12, 2022, EMA Comirnaty® (bivalent BA.4/5) Assessment Report) at 5; Exhibit 29 (March 2023, FDA Comirnaty® (bivalent BA.4/5) Fact Sheet and Prescribing Information), Prescribing Information at 52.

59. On information and belief, apart from the open reading frame region coding for a viral spike protein of the SARS-CoV-2 Omicron BA.4/5 coronavirus variants, the components of the famtozinameran mRNA active ingredient are unchanged as compared to the tozinameran mRNA active ingredient as set forth above in paragraph 51. *See*, *e.g.*, Exhibit 22 (December 15, 2023, EMA Comirnaty® EPAR Product Information) at 98; Exhibit 30 (Proposed International Nonproprietary Names List 128 – COVID-19 Addendum) at 3.

60. The Comirnaty® (bivalent BA.4/5) vaccine product elicits an immune response to the spike proteins of both the original SARS-CoV-2 strain and Omicron BA.4/5 SARS-CoV-2 variants. *See*, *e.g.*, Exhibit 22 (December 15, 2023, EMA Comirnaty® EPAR Product Information) at 105–114; Exhibit 27 (September 12, 2022, EMA Comirnaty® (bivalent BA.4/5) Assessment Report) at 24; Exhibit 29 (March 14, 2023, FDA Comirnaty® (bivalent BA.4/5) Fact Sheet and Prescribing Information), Prescribing Information at 52.

61. In response to the continued evolution of SARS-CoV-2, Defendants subsequently advanced dosage forms of a new monovalent vaccine for commercial marketing authorization and/or approval: the Comirnaty® (monovalent XBB.1.5) vaccine. *See*, *e.g.*, Exhibit 31 (June 23, 2023, Pfizer press release).

62. The Comirnaty® (monovalent XBB.1.5) vaccine contains a single mRNA active ingredient, "raxtozinameran," which encodes a viral spike protein of the Omicron XBB.1.5 variant of SARS-CoV-2. *See*, *e.g.*, Exhibit 22 (December 15, 2023, EMA Comirnaty® EPAR Product Information) at 190 ("Raxtozinameran is a single-stranded, 5'-capped messenger RNA (mRNA) … encoding the viral spike (S) protein of SARS-CoV-2 (Omicron XBB.1.5)."); Exhibit 32 (Proposed International Nonproprietary Names List 129 – COVID-19) at 3; Exhibit 33 (September 2023, FDA Comirnaty® (monovalent XBB.1.5) Package Insert) at 20.

63. On information and belief, apart from the open reading frame region coding for a viral spike protein of the SARS-CoV-2 Omicron XBB.1.5 coronavirus variant, the components of the raxtozinameran mRNA active ingredient are unchanged as compared to the tozinameran mRNA active ingredient as set forth above in paragraph 51. *See*, *e.g.*, Exhibit 22 (December 15, 2023, EMA Comirnaty® EPAR Product Information) at 190; Exhibit 32 (Proposed International Nonproprietary Names List 129 – COVID-19) at 3.

64. The Comirnaty® (monovalent XBB.1.5) vaccine product elicits an immune response to the spike protein of the Omicron XBB.1.5 SARS-CoV-2 variant. *See*, *e.g.*, Exhibit 22 (December 15, 2023, EMA Comirnaty® EPAR Product Information) at 197–207; Exhibit 33 (September 2023, FDA Comirnaty® (monovalent XBB.1.5) Package Insert) at 20.

65. In addition to the mRNA active substance(s), all of Defendants' accused Comirnaty® COVID-19 vaccines contain the following four lipid ingredients:

Chemical Name	Shorthand
((4-hydroxybutyl)azanediyl)bis(hexane-6,1-diyl)bis(2-hexyldecanoate)	"ALC-0315"
2-[(polyethylene glycol)-2000]-N,N-ditetradecylacetamide	"ALC-0159"
1,2-distearoyl-sn-glycero-3-phosphocholine	"DSPC"
cholesterol	(N/A)

Exhibit 22 (December 15, 2023, EMA Comirnaty® EPAR Product Information) at 17, 95, 114, 208, 288, 304, 308, 324; Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19; Exhibit 35 (July 14, 2023, FDA Comirnaty® (bivalent BA.4/5) EUA Fact Sheet and Package Insert) at 53; Exhibit 33 (September 2023, FDA Comirnaty® (monovalent XBB.1.5) Package Insert) at 20.

66. Each of the Accused Products comprises lipid formulations with the same relative molar percentages of the foregoing lipid ingredients. *See*, *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("Each 0.3 mL dose of the COMIRNATY … also includes the following ingredients: lipids (0.43 mg ((4-hydroxybutyl)azanediyl)bis(hexane-6,1-diyl)bis(2-hexyldecanoate), 0.05 mg 2-(polyethylene glycol 2000)-N,N-ditetradecylacetamide, 0.09 mg 1,2-distearoyl-sn-glycero-3-phosphocholine, and 0.2 mg cholesterol[.]"); Exhibit 26 (December 7, 2022, EMA (bivalent BA.1) Assessment Report) at 11; Exhibit 35 (July 14, 2023, FDA Comirnaty (bivalent BA.4/5) EUA Fact Sheet and Package Insert) at 53; Exhibit 33 (September 2023, Comirnaty® (monovalent XBB.1.5) vaccine Package Insert) at 20.

B. Defendants' Infringement in the United States

67. On December 11, 2020, FDA granted the first Emergency Use Authorization (EUA) for the use of Defendants' monovalent BNT162b2 original SARS-CoV-2 (2019) vaccine (later named Comirnaty®; here Comirnaty® (original monovalent)) to prevent COVID-19 caused by SARS-CoV-2. Exhibit 36 (December 11, 2020, FDA News Release); Exhibit 20 (December

11, 2020, FDA Comirnaty® (original monovalent) EUA Review Memo). The authorized regimen was a two-dose primary vaccination series administered 21 days apart in individuals 16 years of age and older. *Id*.

68. On May 10, 2021, FDA expanded EUA for Comirnaty® (original monovalent) two-dose primary vaccination series to children and adolescents 12 years through 15 years of age. Exhibit 37 (May 10, 2021, FDA Comirnaty® (original monovalent) EUA Letter).

69. On August 12, 2021, FDA expanded EUA for Comirnaty® (original monovalent) to a third primary dose (at least 28 days after the second dose) for certain higher risk individuals 12 years of age or older. Exhibit 38 (August 12, 2021, FDA News Release); Exhibit 39 (August 12, 2021, FDA Comirnaty (original monovalent) EUA Review Memo).

70. On August 23, 2021, FDA granted full approval of Defendants' BLA for Comirnaty® (original monovalent) COVID-19 vaccine two-dose primary vaccination series in individuals 16 years of age and older. Exhibit 8 (August 23, 2021, FDA Comirnaty® (original monovalent) Approval Letter).

71. On September 22, 2021, FDA expanded EUA for Comirnaty® (original monovalent) to a third dose (a first booster) six months after completion of the primary two-dose vaccination series for individuals 65 years of age or older, or certain other higher risk individuals 18 to 64 years of age. Exhibit 40 (September 22, 2021, FDA News Release); Exhibit 41 (September 22, 2021, FDA Comirnaty® (original monovalent) EUA Review Memo).

72. On October 29, 2021, FDA expanded EUA for Comirnaty® (original monovalent) two-dose primary vaccination series to children 5 through 11 years of age. Exhibit 42 (October 29, 2021, FDA News Release); Exhibit 43 (October 29, 2021, FDA Comirnaty® (original monovalent) EUA Review Memo).

73. On November 19, 2021, FDA expanded EUA for Comirnaty® (original monovalent) to a third dose (a first booster) for all individuals 18 years and older who had completed an authorized primary vaccination series. Exhibit 44 (November 19, 2021, FDA News Release); Exhibit 45 (November 19, 2021, FDA Comirnaty® (original monovalent) EUA Review Memo).

74. On December 9, 2021, FDA expanded EUA for Comirnaty® (original monovalent) to a third dose (a first booster) dose for all individuals 16 and 17 years of age who had completed an authorized primary vaccination series. Exhibit 46 (December 9, 2021, FDA News Release); Exhibit 47 (December 8, 2021, FDA Comirnaty® (original monovalent) EUA Review Memo).

75. On January 3, 2022, FDA expanded EUA for Comirnaty® (original monovalent) to a third dose (a first booster) for all individuals 12 years of age and older. Exhibit 48 (January 3, 2022, FDA News Release).

76. On March 29, 2022, FDA expanded EUA for Comirnaty® (original monovalent) to a fourth dose (a second booster) at least four months after receipt of a first booster dose of any FDA authorized or approved COVID-19 vaccine for individuals over 50 years of age and for immunocompromised patients 12 years of age and older. Exhibit 49 (March 29, 2022, FDA News Release).

77. On May 17, 2022, FDA expanded EUA for Comirnaty® (original monovalent) to a third dose (a first booster) for children 5 years through 11 years of age. Exhibit 50 (May 17, 2022, FDA News Release as preserved by The Wayback Machine, May 17, 2022[6]); Exhibit 51 (May 17, 2022, FDA Comirnaty® (original monovalent) EUA Review Memo).

[6] Available at https://web.archive.org/web/20220517152524/https:/www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-expands-eligibility-pfizer-biontech-covid-19-vaccine-booster-dose; preserved April 9, 2024.

78. On June 17, 2022, FDA expanded EUA for Comirnaty® (original monovalent) to a three-dose primary vaccination series for children 6 months through 4 years of age. Exhibit 52 (June 17, 2022, FDA News Release); Exhibit 53 (June 16, 2022, FDA Comirnaty® (original monovalent) EUA Review Memo).

79. On August 31, 2022, FDA granted EUA for Comirnaty (bivalent BA.4/5) as a single booster dose in patients 12 years of age and older who had received a primary series or primary series and first booster of any authorized or approved COVID-19 vaccine. Exhibit 54 (August 31, 2022, FDA News Release as preserved by The Wayback Machine, September 1, 2022[7]); Exhibit 55 (August 31, 2022, FDA Comirnaty® (bivalent BA.4/5) EUA Review Memo). FDA also revised the EUA for Comirnaty® (original monovalent) to no longer include use as a booster dose in individuals 12 years of age and older. Exhibit 54 (August 31, 2022, FDA News Release as preserved by The Wayback Machine, September 1, 2022); Exhibit 55 (August 31, 2022, FDA Comirnaty® (bivalent BA.4/5) EUA Review Memo).

80. On October 12, 2022, FDA expanded EUA for Comirnaty® (bivalent BA.4/5) as a booster dose in children 5 through 11 years of age who had received a primary series or primary series and booster of any authorized or approved COVID-19 vaccine. Exhibit 56 (October 12, 2022, FDA News Release as preserved by The Wayback Machine, October 13, 2022[8]); Exhibit 57 (October 11, 2022, FDA Comirnaty® (bivalent BA.4/5) EUA Review Memo).

[7] Available at https://web.archive.org/web/20220901002611/https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-authorizes-moderna-pfizer-biontech-bivalent-covid-19-vaccines-use; preserved April 9, 2024.
[8] Available at https://web.archive.org/web/20221013015339/https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-authorizes-moderna-and-pfizer-biontech-bivalent-covid-19-vaccines; preserved April 9, 2024.

81. On December 8, 2022, FDA expanded EUA for Comirnaty® (bivalent BA.4/5) as the third dose in a primary series in children under 5 years of age who had received two primary doses of Comirnaty® (original monovalent) and revised the EUA for Comirnaty® (original monovalent) to no longer include its use as the third primary dose for this patient population. Exhibit 58 (December 8, 2022, FDA News Release as preserved by The Wayback Machine, December 9, 2022[9]); Exhibit 59 (December 8, 2022, FDA Comirnaty® (bivalent BA.4/5) EUA Review Memo).

82. On March 14, 2023, FDA expanded EUA for Comirnaty® (bivalent BA.4/5) as a fourth dose (a first booster) dose in children 6 months through 4 years of age who had received a three-dose primary series of Comirnaty® (original monovalent or original monovalent followed by bivalent BA.4/5) vaccine. Exhibit 60 (March 14, 2023, FDA News Release); Exhibit 29 (March 14, 2023, FDA Comirnaty® (bivalent BA.4/5) EUA Fact Sheet and Prescribing Information).

83. On April 18, 2023, FDA expanded EUA for Comirnaty® (bivalent BA.4/5) to be used for all doses (primary and booster) in most adults and pediatric populations as well as other dosage regimes for certain individuals based on age or immunocompromised status. Exhibit 61 (April 18, 2023, FDA News Release). FDA also rescinded all authorizations for use of Comirnaty® (original monovalent) vaccine in the United States. *Id*.

84. On September 11, 2023, FDA granted full approval of Defendants' supplemental BLA for Comirnaty® (monovalent XBB.1.5) COVID-19 vaccine single dose regimen for individuals 12 years of age and older. Exhibit 62 (September 11, 2023, FDA Comirnaty® (monovalent XBB.1.5) Approval Letter). FDA also granted EUA for Comirnaty® (monovalent

[9] Available at https://web.archive.org/web/20221209225236/https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-authorizes-updated-bivalent-covid-19-vaccines-children-down-6-months; preserved April 9, 2024.

XBB.1.5) as a single dose for individuals 6 months through 11 years of age. Exhibit 63 (September 11, 2023, FDA News Release); Exhibit 64 (September 11, 2023, FDA Comirnaty® (monovalent XBB.1.5) EUA Review Memo). FDA also rescinded EUAs for the Comirnaty® (bivalent BA.4/5) vaccine. Exhibit 63 (September 11, 2023, FDA News Release); Exhibit 64 (September 11, 2023, FDA Comirnaty® (monovalent XBB.1.5) EUA Review Memo).

85. Pursuant to these FDA authorizations and approvals, Defendants have offered to sell and continue to offer for sale, and have sold and continue to sell, the Accused Products in Delaware, the United States, and worldwide.

86. Defendants have directed and instructed, and continue to direct and instruct, the administration of the Accused Products in the United States, in accordance with the FDA authorized and approved uses of those products.

87. On information and belief, Defendants have made and continue to make, and have had made and continue to have made, the Accused Products in the United States. *See*, *e.g.*, Exhibit 8 (August 23, 2021, FDA Comirnaty® (original monovalent) Approval Letter) at 1; Exhibit 9 (excerpts from March 30, 2022, BioNTech SE 2021FY Annual Report (Form 20-F)) at 89; Exhibit 26 (December 7, 2022, EMA Comirnaty® BA.1 Assessment Report) at 13, 16–17; Exhibit 62 (September 11, 2023, FDA Comirnaty® (monovalent XBB.1.5) Approval Letter) at 1; Exhibit 27 (September 12, 2022, EMA Comirnaty® BA.4/5 Assessment Report) at 13, 16–17.

88. On information and belief, Accused Products manufactured by or for Defendants in the United States were and are still distributed for sale and sold both in the United States and outside the United States. *See*, *e.g.*, Exhibit 26 (December 7, 2022, EMA Comirnaty® BA.1 Assessment Report) at 13, 16–17; Exhibit 27 (September 12, 2022, EMA Comirnaty® BA.4/5

Assessment Report) at 13, 16–17; Exhibit 9 (excerpts from March 30, 2022, BioNTech SE 2021FY Annual Report (Form 20-F)) at 89.

89. Defendants have profited significantly from the inventions claimed in the Patents-in-Suit. From sales of the Accused Products alone, Defendant Pfizer reported over $8 billion in U.S. revenue (and over $37 billion globally) in 2022 and over $2 billion in U.S. revenue (and over $11 billion globally) in 2023. Exhibit 65 (excerpts from February 23, 2023, Pfizer Inc. 2022FY Annual Report (Form 10-K)) at 33; Exhibit 66 (excerpts from February 22, 2024, Pfizer Inc. 2023FY Annual Report (Form 10-K)) at 38. Defendant BioNTech reported over €12 billion in revenues from shares of profits and milestones from sales of the Accused Products from collaboration partners (and over €17 billion in total COVID-19 vaccine revenue) in 2022 and over €3 billion in revenues from shares of profits from sales of the Accused Products from collaboration partners in 2023. Exhibit 67 (excerpts from March 27, 2023, BioNTech SE 2022FY Annual Report (Form 20-F)) at 162; Exhibit 68 (excerpts from March 20, 2024, BioNTech 2023FY Annual Report (Form 20-F)) at 165.

90. Defendants stand to continue to profit significantly through continued infringement of GSK Biologicals's Patents-in-Suit without taking a license. In September 2023, Defendants set the list price of their Comirnaty® COVID-19 vaccine product at $120 per dose, an approximately four-fold increase from the pandemic pricing. Exhibit 69 (September 12, 2023, *Reuters* article, "COVID vaccine manufacturers set list price between $120-$130 per dose"[10]); Exhibit 70 (October 21, 2022, *Reuters* article, "Pfizer expects to hike U.S. COVID vaccine price to $110-130 per

[10] Available at https://www.reuters.com/business/healthcare-pharmaceuticals/covid-vaccine-manufacturers-set-list-price-between-120-130-per-dose-2023-09-12/; preserved April 3, 2024.

dose"[11]) (noting original pandemic price of Comirnaty® COVID-19 vaccine was around $30 per dose).

COUNT I

(Infringement of the '693 Patent)

91. GSK incorporates by reference paragraphs 1–90.

92. GSK Biologicals is the lawful owner by assignment of the '693 patent, which is entitled "Vaccine for Eliciting Immune Response Comprising RNA Encoding an Immunogen and Lipid Formulations Comprising Mole Percentage of Lipids" and was duly and legally issued by the U.S. Patent and Trademark Office on May 2, 2023. A true and correct copy of the '693 patent is attached as Exhibit 1. The patent application issuing into the '693 patent was published on November 17, 2022, as Publication No. US 2022/0362152 A1. *See* Exhibit 1 at Prior Publication Data.

93. Each claim of the '693 patent is valid and enforceable.

94. Defendants have directly infringed and continue to directly infringe one or more claims of the '693 patent under 35 U.S.C. § 271(a), either literally or under the doctrine of equivalents, by making, using, offering to sell, or selling within the United States, or importing into the United States, each of the Accused Products embodying GSK Biologicals's patented inventions as disclosed by and claimed in the '693 patent, without authority or license to do so, during the term of the '693 patent.

95. In addition or in the alternative, Defendants have induced, and continue to induce, direct infringement by third parties of one or more claims of the '693 patent under 35 U.S.C. § 271(b), either literally or under the doctrine of equivalents, by making, selling and/or offering

[11] Available at https://www.reuters.com/business/healthcare-pharmaceuticals/pfizer-expects-price-covid-vaccine-110-130-per-dose-2022-10-20/; preserved April 3, 2024.

for sale in the United States, and/or importing into the United States, each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products embodying GSK Biologicals's patented inventions as disclosed by and claimed in the '693 patent, without authority or license to do so, during the term of the '693 patent.

96. In addition or in the alternative, Defendants have contributed, and continue to contribute, to the direct infringement by third parties of one or more claims of the '693 patent under 35 U.S.C. § 271(c), either literally or under the doctrine of equivalents, by making, selling and/or offering for sale in the United States, and/or importing into the United States, each of the Accused Products embodying GSK Biologicals's patented inventions as disclosed by and claimed in the '693 patent, without authority or license to do so, during the term of the '693 patent, knowing that those products constitute a material part of the inventions of the '693 patent, knowing that those products are especially made or adapted to infringe the '693 patent, and knowing that those products are not staple articles or commodities of commerce suitable for substantial non-infringing use.

97. For example, on information and belief, each of the Accused Products satisfies each and every element of at least claim 1 of the '693 patent. Defendants' actions with respect to each of the Accused Products have therefore infringed at least this exemplary claim of the '693 patent.

98. Claim 1 of the '693 patent recites:

> A formulation comprising:
>
> ribonucleic acid (RNA) molecules comprising a sequence that encodes an immunogen; and
>
> lipids comprising: (a) from 20 mole % to 70 mole % cationic lipid, (b) an anionic or a zwitterionic lipid, (c) a polyethylene glycol-conjugated (PEG-conjugated) lipid, and (d) from 5 mole % to 80 mole % cholesterol; wherein:
>
> the lipids encapsulate at least half of the RNA molecules;

the formulation is immunogenic in vivo by eliciting an antibody response against the immunogen in vivo; and

the cationic lipid comprises a tertiary amine and has a pKa from 6.07 to 7.6; and

whereby the pKa is determined at standard temperature and pressure by the following:

(1) admixing 400 µL of 2 mM cationic lipid that is in ethanol and 800 µL of 0.3 mM fluorescent probe 6-(p-toluidino)-2-naphthalenesulfonic acid (TNS), which is in 90 volume % ethanol and 10 volume % methanol, thereby obtaining a lipid/TNS mixture;

(2) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a first buffer consisting essentially of a sodium salt buffer comprising 20 mM sodium phosphate, 25 mM sodium citrate, 20 mM sodium acetate, and 150 mM sodium chloride, wherein the first buffer has a pH from 4.44 to 4.52, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining a first mixture, and dispensing 100 µL of the first mixture in a first well of a 96-well plate, which has a clear bottom;

(3) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a second buffer consisting essentially of the sodium salt buffer, wherein the second buffer has a pH of 5.27, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining a second mixture, and dispensing 100 µL of the second mixture in a second well of the 96-well plate;

(4) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a third buffer consisting essentially of the sodium salt buffer, wherein the third buffer has a pH from 6.15 to 6.21, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining a third mixture, and dispensing 100 µL of the third mixture in a third well of the 96-well plate;

(5) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a fourth buffer consisting essentially of the sodium salt buffer, wherein the fourth buffer has a pH of 6.57, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining a fourth mixture, and dispensing 100 µL of the fourth mixture in a fourth well of the 96-well plate;

(6) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a fifth buffer consisting essentially of the sodium salt buffer, wherein the fifth buffer has a pH from 7.10 to 7.20, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining

a fifth mixture, and dispensing 100 µL of the fifth mixture in a fifth well of the 96-well plate;

(7) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a sixth buffer consisting essentially of the sodium salt buffer, wherein the sixth buffer has a pH from 7.72 to 7.80, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining a sixth mixture, and dispensing 100 µL of the sixth mixture in a sixth well of the 96-well plate;

(8) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a seventh buffer consisting essentially of the sodium salt buffer, wherein the seventh buffer has a pH from 8.27 to 8.33, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining a seventh mixture, and dispensing 100 µL of the seventh mixture in a seventh well of the 96-well plate;

(9) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of an eighth buffer consisting essentially of the sodium salt buffer, wherein the eighth buffer has a pH from 10.47 to 11.12, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining an eighth mixture, and dispensing 100 µL of the eighth mixture in an eighth well of the 96-well plate;

(10) measuring the fluorescence at a wavelength of 431 nm with an excitation wavelength of 322 nm and a cut-off below a wavelength of 420 nm of each of the first through eighth wells and an empty well of the 96-well plate, thereby obtaining a measured fluorescence for each of the p empty well and the first through eighth wells;

(11) subtracting the measured fluorescence of the empty well from each of the measured fluorescences of the first through eighth wells, thereby obtaining a blank-subtracted fluorescence for each of the first through eighth mixtures;

(12) normalizing each of the blank-subtracted fluorescences of the first through eighth mixtures to the blank-subtracted fluorescence of the first mixture thereby obtaining a relative fluorescence for each of the first through eighth mixtures, the relative fluorescence being 1 for the first mixture;

(13) obtaining a line of best fit of the pHs of the first through eighth buffers versus the respective relative fluorescences of the first through eighth mixtures; and

(14) defining the pKa as the pH on the line of best fit at which a relative fluorescence of 0.5 is obtained.

99. Each of the Accused Products comprises a "formulation." *See* paragraphs 47–66, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("The nucleoside-modified mRNA in COMIRNATY is formulated in lipid particles[.]"); Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 58 ("The nucleoside-modified messenger RNA in the vaccine is formulated in lipid nanoparticles[.]").

100. Each of the Accused Products comprises "ribonucleic acid (RNA) molecules comprising a sequence that encodes an immunogen." *See* paragraphs 47–66, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("COMIRNATY … contains 30 mcg of a nucleoside-modified messenger RNA (mRNA) encoding the viral spike glycoprotein of SARS-CoV-2."); Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 15 ("The active substance consists of … mRNA that is translated into a codon-optimized sequence encoding the spike antigen of SARS-CoV-2[.]").

101. Each of the Accused Products comprises "lipids comprising: (a) … [a] cationic lipid, (b) an anionic or a zwitterionic lipid, (c) a polyethylene glycol-conjugated (PEG-conjugated) lipid, and (d) … cholesterol." *See* paragraphs 47–66, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 (identifying lipid ingredients).

102. ALC-0315 is a "cationic lipid." *See*, *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 23–24 ("The ALC-0315 novel excipient is a cationic lipid containing a tertiary amine …."); Exhibit 71 (ALC-0315 Product Information, Cayman Chemical) (providing structure); Exhibit 72 (Schoenmaker *et al.*, "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability," *Intl. J. Pharm.* 601, 120586 (2021)) at Fig. 6 (providing structure and identifying ALC-0315 as an "[i]onizable cationic lipid").

103. DSPC is a "zwitterionic lipid." *See*, *e.g.*, Exhibit 73 (DSPC Product Information, Polysciences) ("[DSPC] is a zwitterionic phospholipid that is used in the preparation of liposomes for transfection and drug delivery applications.").

104. ALC-0159 is a "polyethylene glycol-conjugated (PEG-conjugated) lipid." *See*, *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 24 ("The ALC-0159 novel excipient is PEGylated lipid …."); Exhibit 74 (ALC-0159 Product Information, Echelon Biosciences) ("ALC-0159 is a PEGylated lipid which has been used to form lipid nanoparticles for delivery of RNA. ALC-0159 is one of the components in the BNT162b2 vaccine[.]"); Exhibit 72 (Schoenmaker *et al*., "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability," *Intl. J. Pharm.* 601, 120586 (2021)) at Fig. 6 (identifying ALC-0159 to be a "PEG-lipid").

105. Each of the Accused Products comprises "lipids comprising … from 20 mole % to 70 mole % cationic lipid." *See* paragraphs 47–66, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 (identifying the quantity of each lipid component); *see also* Exhibit 72 (Schoenmaker *et al*., "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and stability," *Intl. J. Pharm.* 601, 120586 (2021)) at 3, Table 1 (reporting ionizable cationic lipid ALC-0315 makes up 46.3 mole % of the lipids present in Comirnaty® products).

106. Each of the Accused Products comprises "lipids comprising … from 5 mole % to 80 mole % of cholesterol." *See* paragraphs 47–66, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 (identifying the quantity of each lipid component); *see also* Exhibit 72 (Schoenmaker *et al*., "mRNA-lipid nanoparticle COVID-19

vaccines: Structure and stability," *Intl. J. Pharm.* 601, 120586 (2021)) at 3, Table 1 (reporting cholesterol makes up 42.7 mole % of the lipids present in Comirnaty® products).

107. On information and belief, the lipids of each of the Accused Products "encapsulate at least half of the RNA molecules." *See* paragraphs 47–66, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("The nucleoside-modified mRNA in COMIRNATY is formulated in lipid particles, which enable delivery of the mRNA into host cells to allow expression of the SARS-CoV-2 antigen."); *see also* Exhibit 72 (Schoenmaker *et al.*, "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability," *Intl. J. Pharm.* 601, 120586 (2021)) at 4 ("In mRNA-LNP formulations, such as those used in mRNA vaccines ... encapsulation efficiencies ... are typically > 90%.").

108. Each of the Accused Products is "immunogenic in vivo by eliciting an antibody response against the immunogen in vivo" at least when used in accordance with the FDA and EMA authorized and approved indications. *See* paragraphs 47–90, above; *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 58 ("The vaccine elicits both neutralizing antibody and cellular immune responses to the spike (S) antigen, which may contribute to protection against COVID-19."); Exhibit 24 (September 1, 2022, Pfizer press release) ("[T]he bivalent vaccine with mRNA encoding the wild-type and the BA.1 spike proteins provides [] neutralizing antibody titers against the Omicron BA.1 and BA.4/BA.5 sublineages[.]"); Exhibit 25 (November 4, 2022, Pfizer press release) ("Among the overall study population who received the Omicron BA.4/BA.5-adapted bivalent vaccine, there was a substantially higher increase in Omicron BA.4/BA.5-neutralizing antibody titers compared to pre-booster levels."); Exhibit 64 (September 11, 2023, FDA Comirnaty® (monovalent XBB.1.5) EUA Review Memo) at 17–18 (extrapolating immunological response from the prior Comirnaty® COVID-19 vaccine products

and stating, "preclinical data demonstrate that, when compared with the Pfizer-BioNTech COVID-19 Vaccine, Bivalent (Original and Omicron BA.4/BA.5), Pfizer-BioNTech COVID-19 Vaccine (2023-2024 Formula) induces higher neutralizing antibody titers against XBB sublineages, including XBB.1.5, XBB.1.16, XBB.1.16.1, and XBB.2.3.").

109. On information and belief, when employing the "fluorescent probe 6-(p-toluidino)-2-naphthalenesulfonic acid (TNS)" and following steps (1) to (14) of claim 1 of the '693 patent to "obtain[] a relative fluorescence" in each of the described pH-buffered mixtures and "defining the pKa as the pH on the line of best fit at which a relative fluorescence of 0.5 is obtained," the cationic lipid used in each of the Accused Products—ALC-0315—exhibits a pKa falling between 6.07 and 7.6. *See*, *e.g.*, Exhibit 75 (McKenzie *et al.*, "mRNA synthesis and encapsulation in ionizable lipid nanoparticles," *Current Protocols* 3, e898 (2023)) at 19 (reporting a pKa of 6.284 for ALC-0315 in a TNS assay); Exhibit 76 (International PCT Application Publication Number WO 2017/075531 A1) at 48 and 50, Table 3 (reporting a pKa of 6.09 for ALC-0315 (cationic lipid "No. 3") in a TNS assay); Exhibit 77 (Tilstra *et al.*, "Iterative Design of Ionizable Lipids for Intramuscular mRNA Delivery," *J. Am. Chem. Soc.* 145, 2294–2304 (2023) with supplementary information) at Figure S11 (reporting a pKa of 6.27 for ALC-0315 in a TNS assay).

110. Defendants packaged, promoted, and sold, and continue to package promote and sell, each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States with FDA-approved packaging and package inserts comprising labeling and prescribing information that instruct health care practitioners on their use in accordance with the FDA authorized and approved indications. *See* paragraphs 47–90, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert); Exhibit 35 (July 14, 2023, FDA Comirnaty® (bivalent BA.4/5) EUA Fact Sheet

and Package Insert); Exhibit 33 (September 2023, FDA Comirnaty® (monovalent XBB.1.5) Package Insert).

111. Defendants created and disseminated, and continue to create and disseminate, by means separate from the packaging and package inserts of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products, supporting materials, instructions, and/or technical information that instruct health care practitioners on the use of each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States in accordance with the FDA authorized and approved indications. *See*, *e.g.*, Exhibit 78 (www.comirnaty.com as preserved by The Wayback Machine, August, 27, 2021[12]); Exhibit 79 (www.comirnaty.com/eua-bivalent as preserved by The Wayback Machine, September, 22, 2022[13]); Exhibit 80 (www.comirnaty.com/eua-six-months-to-eleven-years; preserved April 5, 2024).

112. Defendants have been and are aware that the use of each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States in accordance with the FDA authorized and approved indications identified above in paragraphs 67–90 infringes at least exemplary claim 1 of the '693 patent.

113. Defendants have been and are aware that healthcare providers use each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States in accordance with the FDA authorized and approved

[12] Available at https://web.archive.org/web/20210827220339/https://www.comirnaty.com/; preserved on April 5, 2024.
[13] Available at https://web.archive.org/web/20220922181232/https://www.comirnaty.com/eua-bivalent; preserved on April 5, 2024.

indications identified above in paragraphs 67–90 and thereby infringe at least exemplary claim 1 of the ’693 patent.

114. None of the Accused Products is a staple article or commodity of commerce suitable for use in the United States other than in accordance with the FDA authorized and approved indications identified above in paragraphs 67–90.

115. Defendants actively, knowingly, and specifically intended to induce, and induced, and continue to actively, knowingly, and specifically intend to induce, and induce, infringement of at least claim 1 of the ’693 patent by packaging, promoting, selling or otherwise supplying, directly or indirectly, each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products to healthcare providers, with the knowledge and intent that healthcare providers will use the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products supplied by Defendants according to the FDA authorized and approved infringing indications.

116. GSK has suffered and continues to suffer damages from Defendants’ infringement of the ’693 patent.

117. GSK is entitled to an award of monetary damages, including a reasonable royalty, for Defendants’ infringement of the ’693 patent.

118. Defendants have had knowledge of the ’693 patent and specific notice of its infringement at least since April 24, 2024, by communications between GSK and Defendants. *See* Exhibits 81-82.

119. Defendants’ infringement of the ’693 patent has been and continues to be willful and deliberate at least since they received specific notice of their infringement from GSK on April 24, 2024. *See id.*

120. Defendants' conduct with respect to the '693 patent makes this case exceptional under 35 U.S.C. § 285.

COUNT II

(Infringement of the '694 Patent)

121. GSK incorporates by reference paragraphs 1–120.

122. GSK Biologicals is the lawful owner by assignment of the '694 patent, which is entitled "Vaccine for Eliciting Immune Response Comprising Lipid formulations and RNA Encoding Multiple Immunogens" and was duly and legally issued by the U.S. Patent and Trademark Office on May 2, 2023. A true and correct copy of the '694 patent is attached as Exhibit 2. The patent application issuing into the '694 patent was published on November 3, 2022, as Publication No. US 2022/0347097 A1. *See* Exhibit 2 at Prior Publication Data.

123. Each claim of the '694 patent is valid and enforceable.

124. Defendants have directly infringed and continue to directly infringe one or more claims of the '694 patent under 35 U.S.C. § 271(a), either literally or under the doctrine of equivalents, by making, using, offering to sell, or selling the United States, or importing into the United States, each of the Comirnaty® (bivalent BA.1) and Comirnaty® (bivalent BA.4/5) products embodying GSK Biologicals's patented inventions as disclosed by and claimed in the '694 patent, without authority or license to do so, during the term of the '694 patent.

125. In addition or in the alternative, Defendants have induced, and continue to induce, direct infringement by third parties of one or more claims of the '694 patent under 35 U.S.C. § 271(b), either literally or under the doctrine of equivalents, by making, selling and/or offering for sale in the United States, and/or importing into the United States, the Comirnaty® (bivalent BA.4/5) product embodying GSK Biologicals's patented inventions as disclosed by and claimed in the '694 patent, without authority or license to do so, during the term of the '694 patent.

126. In addition or in the alternative, Defendants have contributed, and continue to contribute, to the direct infringement by third parties of one or more claims of the '694 patent under 35 U.S.C. § 271(c), either literally or under the doctrine of equivalents, by making, selling and/or offering for sale in the United States, and/or importing into the United States, each of the each of the Comirnaty® (bivalent BA.1) and Comirnaty® (bivalent BA.4/5) products embodying GSK Biologicals's patented inventions as disclosed by and claimed in the '694 patent, without authority or license to do so, during the term of the '694 patent, knowing that those products constitute a material part of the inventions of the '694 patent, knowing that those products are especially made or adapted to infringe the '694 patent, and knowing that those products are not staple articles or commodities of commerce suitable for substantial non-infringing use.

127. For example, on information and belief, each of the Comirnaty® (bivalent BA.1) and Comirnaty® (bivalent BA.4/5) products satisfies each and every element of at least claim 1 of the '694 patent. Defendants' actions with respect to the Comirnaty® (bivalent BA.1) and Comirnaty® (bivalent BA.4/5) products have therefore infringed at least this exemplary claim of the '694 patent.

128. Claim 1 of the '694 patent recites:

> A formulation comprising:
>
> a first species of ribonucleic acid (RNA) molecules comprising a sequence that encodes a first immunogen;
>
> a second species of RNA molecules comprising a sequence that encodes a second immunogen; and
>
> lipids comprising: (a) a cationic lipid, (b) an anionic lipid or a zwitterionic lipid, (c) a polyethylene glycol-conjugated (PEG-conjugated) lipid, and (d) a cholesterol, wherein:
>
> the lipids encapsulate at least half of the first species of RNA molecules and at least half of the second species of RNA molecules;

the cationic lipid comprises a tertiary amine and has a pKa from 6.07 to 7.6; and

the formulation is immunogenic in vivo by eliciting an antibody response against the first immunogen and the second immunogen in vivo; and

whereby the pKa is determined at standard temperature and pressure by the following:

(1) admixing 400 µL of 2 mM of the cationic lipid that is in ethanol and 800 µL of 0.3 mM of fluorescent probe 6-(p-toluidino)-2-naphthalenesulfonic acid (TNS), which is in 90 volume % ethanol and 10 volume % methanol, thereby obtaining a lipid/TNS mixture;

(2) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a first buffer consisting essentially of a sodium salt buffer consisting of 20 mM sodium phosphate, 25 mM sodium citrate, 20 mM sodium acetate, and 150 mM sodium chloride, wherein the first buffer has a pH from 4.44 to 4.52, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining a first mixture, and dispensing 100 µL of the first mixture in a first well of a 96-well plate, which has a clear bottom;

(3) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a second buffer consisting essentially of the sodium salt buffer, wherein the second buffer has a pH of 5.27, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining a second mixture, and dispensing 100 µL of the second mixture in a second well of the 96-well plate;

(4) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a third buffer consisting essentially of the sodium salt buffer, wherein the third buffer has a pH from 6.15 to 6.21, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining a third mixture, and dispensing 100 µL of the third mixture in a third well of the 96-well plate;

(5) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a fourth buffer consisting essentially of the sodium salt buffer, wherein the fourth buffer has a pH of 6.57, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining a fourth mixture, and dispensing 100 µL of the fourth mixture in a fourth well of the 96-well plate;

(6) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a fifth buffer consisting essentially of the sodium salt buffer, wherein the fifth buffer has a pH from 7.10 to 7.20, which has been adjusted with

12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining a fifth mixture, and dispensing 100 µL of the fifth mixture in a fifth well of the 96-well plate;

(7) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a sixth buffer consisting essentially of the sodium salt buffer, wherein the sixth buffer has a pH from 7.72 to 7.80, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining a sixth mixture, and dispensing 100 µL of the sixth mixture in a sixth well of the 96-well plate;

(8) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of a seventh buffer consisting essentially of the sodium salt buffer, wherein the seventh buffer has a pH from 8.27 to 8.33, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining a seventh mixture, and dispensing 100 µL of the seventh mixture in a seventh well of the 96-well plate;

(9) admixing 7.5 µL of the lipid/TNS mixture and 242.5 µL of an eighth buffer consisting essentially of the sodium salt buffer, wherein the eighth buffer has a pH from 10.47 to 11.12, which has been adjusted with 12N hydrochloric acid or 6N sodium hydroxide, thereby obtaining an eighth mixture, and dispensing 100 µL of the eighth mixture in an eighth well of the 96-well plate;

(10) measuring the fluorescence at a wavelength of 431 nm with an excitation wavelength of 322 nm and a cut-off below a wavelength of 420 nm of each of the first through eighth wells and an empty well of the 96-well plate, thereby obtaining a measured fluorescence for each of the empty well and the first through eighth wells;

(11) subtracting the fluorescence of the empty well from each of the measured fluorescences of the first through eighth wells, thereby obtaining a blank-subtracted fluorescence for each of the first through eighth mixtures;

(12) normalizing each of the blank-subtracted fluorescences of the first through eighth mixtures to the blank-subtracted fluorescence of the first mixture, thereby obtaining a relative fluorescence for each of the first through eighth mixtures, the relative fluorescence being 1 for the first mixture;

(13) obtaining a line of best fit of the pHs of the first through eighth buffers versus the respective relative fluorescences of the first through eighth mixtures; and

(14) determining the pK_a as the pH on the line of best fit at which a relative fluorescence of 0.5 is obtained.

129. Each of the Comirnaty® (bivalent BA.1) and Comirnaty® (bivalent BA.4/5) products comprises a "formulation." *See* paragraphs 47–66, above; *e.g.*, Exhibit 26 (July 12, 2022, EMA Comirnaty® (original BA.1) Assessment Report) at 5 ("The Bivalent vaccine is formulated in Tris/Sucrose[.]"); Exhibit 29 (March 2023, FDA Comirnaty® (bivalent BA.4/5) Fact Sheet and Prescribing Information), Prescribing Information at 52 ("The modRNA in the Pfizer-BioNTech COVID-19 Vaccine, Bivalent is formulated in lipid particles[.]"); Exhibit 27 (September 12, 2022, EMA Comirnaty® (bivalent BA.4/5) Assessment Report) at 4 ("The vaccine is based on SARS CoV-2 spike (S) glycoprotein antigens encoded in RNA and formulated in lipid nanoparticles (LNPs).").

130. Each of the Comirnaty® (bivalent BA.1) and Comirnaty® (bivalent BA.4/5) products comprises "a first species of ribonucleic acid (RNA) molecules comprising a sequence that encodes a first immunogen." *See* paragraphs 47–66, above; *e.g.*, Exhibit 26 (July 12, 2022, EMA Comirnaty® (bivalent BA.1) Assessment Report) at 6 ("The active substance tozinameran is already approved in the existing Comirnaty® conditional marketing authorization. No changes to the information related to tozinameran are proposed."); Exhibit 27 (September 12, 2022, EMA Comirnaty® (bivalent BA.4/5) Assessment Report) at 5 ("The active substance tozinameran is already approved for the original Comirnaty® vaccine formulations (EU/1/20/1528/001-005). No changes to the information related to tozinameran are proposed.").

131. Each of the Comirnaty® (bivalent BA.1) and Comirnaty® (bivalent BA.4/5) products comprises "a second species of RNA molecules comprising a sequence that encodes a second immunogen." *See* paragraphs 47–66, above; *e.g.*, Exhibit 26 (July 12, 2022, EMA Comirnaty® (bivalent BA.1) Assessment Report) at 6 ("Riltozinameran is a single-stranded, 5'-capped messenger RNA (mRNA) produced using a cell-free *in vitro* transcription from the

corresponding DNA templates, encoding the viral spike (S) protein of SARS-CoV-2 (Omicron BA.1).”); Exhibit 27 (September 12, 2022, EMA Comirnaty® (bivalent BA.4/5) Assessment Report) at 5 (“Famtozinameran is a single-stranded, 5’-capped messenger RNA (mRNA) produced using a cell-free *in vitro* transcription from the corresponding DNA templates, encoding the viral spike (S) protein of SARS-CoV-2 (Omicron BA.4-5).”).

132. Each of the Comirnaty® (bivalent BA.1) and Comirnaty® (bivalent BA.4/5) products comprises “lipids comprising: (a) a cationic lipid, (b) an anionic or a zwitterionic lipid, (c) a polyethylene glycol-conjugated (PEG-conjugated) lipid, and (d) cholesterol.” *See* paragraphs 47–66, above; *e.g.*, Exhibit 26 (July 12, 2022, EMA Comirnaty® (bivalent BA.1) Assessment Report) at 11 (identifying lipid ingredients); Exhibit 35 (July 14, 2023, FDA Comirnaty® (bivalent BA.4/5) EUA Fact Sheet and Package Insert) at 53 (identifying lipid ingredients).

133. ALC-0315 is a “cationic lipid” that “comprises a tertiary amine.” *See*, *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 23–24 (“The ALC-0315 novel excipient is a cationic lipid containing a tertiary amine ….”); Exhibit 71 (ALC-0315 Product Information, Cayman Chemical) (providing structure); Exhibit 72 (Schoenmaker *et al.*, “mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability,” *Intl. J. Pharm.* 601, 120586 (2021)) at Fig. 6 (providing structure and identifying ALC-0315 as an “[i]onizable cationic lipid”).

134. DSPC is a “zwitterionic lipid.” *See*, *e.g.*, Exhibit 73 (DSPC Product Information, Polysciences) (“[DSPC] is a zwitterionic phospholipid that is used in the preparation of liposomes for transfection and drug delivery applications.”).

135. ALC-0159 is a “polyethylene glycol-conjugated (PEG-conjugated) lipid.” *See*, *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report)

at 24 ("The ALC-0159 novel excipient is PEGylated lipid …."); Exhibit 74 (ALC-0159 Product Information, Echelon Biosciences) ("ALC-0159 is a PEGylated lipid which has been used to form lipid nanoparticles for delivery of RNA. ALC-0159 is one of the components in the BNT162b2 vaccine[.]"); Exhibit 72 (Schoenmaker *et al*., "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability," *Intl. J. Pharm.* 601, 120586 (2021)) at Fig. 6 (identifying ALC-0159 to be a "PEG-lipid").

136. On information and belief, the lipids of each of the Comirnaty® (bivalent BA.1) and Comirnaty® (bivalent BA.4/5) products "encapsulate at least half of the first species of RNA molecules and at least half of the second species of RNA molecules." *See* paragraphs 47–66, above; *e.g*., Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("The nucleoside-modified mRNA in COMIRNATY is formulated in lipid particles, which enable delivery of the mRNA into host cells to allow expression of the SARS-CoV-2 antigen."); *see also* Exhibit 72 (Schoenmaker *et al*., "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability," *Intl. J. Pharm.* 601, 120586 (2021)) at 4 ("In mRNA-LNP formulations, such as those used in mRNA vaccines ... encapsulation efficiencies ... are typically > 90%.").

137. On information and belief, when employing the "fluorescent probe 6-(p-toluidino)-2-naphthalenesulfonic acid (TNS)" and following steps (1) to (14) of claim 1 of the '694 patent to "obtain[] a relative fluorescence" in each of the described pH-buffered mixtures and "determining the pKa as the pH on the line of best fit at which a relative fluorescence of 0.5 is obtained," the cationic lipid used in each of the Comirnaty® (bivalent BA.1) and Comirnaty® (bivalent BA.4/5) products—ALC-0315—exhibits a pKa falling between 6.07 and 7.6. *See*, *e.g.*, Exhibit 75 (McKenzie *et al.*, "mRNA synthesis and encapsulation in ionizable lipid nanoparticles," *Current Protocols* 3, e898 (2023)) at 19 (reporting a pKa of 6.284 for ALC-0315 in a TNS assay); Exhibit

76 (International PCT Application Publication Number WO 2017/075531 A1) at 48 and 50, Table 3 (reporting a pKa of 6.09 for ALC-0315 (cationic lipid "No. 3") in a TNS assay); Exhibit 77 (Tilstra *et al.*, "Iterative Design of Ionizable Lipids for Intramuscular mRNA Delivery," *J. Am. Chem. Soc.* 145, 2294–2304 (2023) with supplementary information) at Figure S11 (reporting a pKa of 6.27 for ALC-0315 in a TNS assay).

138. Each of the Comirnaty® (bivalent BA.1) and Comirnaty® (bivalent BA.4/5) products is "immunogenic in vivo by eliciting an antibody response against the first immunogen and the second immunogen in vivo" at least when used in accordance with the FDA and EMA authorized and approved indications. *See* paragraphs 47–90, above; *e.g.*, Exhibit 24 (September 1, 2022, Pfizer press release) ("[T]he bivalent vaccine with mRNA encoding the wild-type and the BA.1 spike proteins provides [] neutralizing antibody titers against the Omicron BA.1 and BA.4/BA.5 sublineages[.]"); Exhibit 25 (November 4, 2022, Pfizer press release) ("Among the overall study population who received the Omicron BA.4/BA.5-adapted bivalent vaccine, there was a substantially higher increase in Omicron BA.4/BA.5-neutralizing antibody titers compared to pre-booster levels.").

139. Defendants packaged, promoted, and sold Comirnaty® (bivalent BA.4/5) in the United States with FDA-approved packaging and package inserts comprising labeling and prescribing information that instruct health care practitioners on their use in accordance with the FDA authorized indications. *See* paragraphs 47–90, above; *e.g.*, Exhibit 35 (July 14, 2023, FDA Comirnaty® (bivalent BA.4/5) EUA Fact Sheet and Package Insert).

140. Defendants created and disseminated by means separate from the packaging and package inserts of Comirnaty® (bivalent BA.4/5), supporting materials, instructions, and/or technical information that instructed health care practitioners on the use of Comirnaty® (bivalent

BA.4/5) in the United States in accordance with the FDA authorized indications. *See*, *e.g.*, Exhibit 79 (www.comirnaty.com/eua-bivalent as preserved by The Wayback Machine, September 22, 2022[14]).

141. Defendants have been and are aware that the use of Comirnaty® (bivalent BA.4/5) in the United States in accordance with the FDA authorized indications identified above in paragraphs 67–90 infringed at least exemplary claim 1 of the '694 patent.

142. Defendants have been and are aware that healthcare providers used Comirnaty® (bivalent BA.4/5) in the United States in accordance with the FDA authorized indications identified above in paragraphs 67–90 and thereby infringed at least exemplary claim 1 of the '694 patent.

143. None of the Comirnaty® (bivalent BA.1) or Comirnaty® (bivalent BA.4/5) products is a staple article or commodity of commerce suitable for use in the United States other than in accordance with the FDA authorized indications identified above in paragraphs 67–90.

144. Defendants actively, knowingly, and specifically intended to induce, and induced, infringement of at least claim 1 of the '694 patent by packaging, promoting, selling or otherwise supplying, directly or indirectly, the Comirnaty® (bivalent BA.4/5) product to healthcare providers, with the knowledge and intent that healthcare providers would use the Comirnaty® (bivalent BA.4/5) products supplied by Defendants according to the FDA authorized infringing indications.

145. GSK has suffered and continues to suffer damages from Defendants' infringement of the '694 patent.

[14] Available at https://web.archive.org/web/20220922181232/https://www.comirnaty.com/eua-bivalent; preserved on April 5, 2024.

146. GSK is entitled to an award of monetary damages, including a reasonable royalty, for Defendants' infringement of the '694 patent.

147. Defendants have had knowledge of the '694 patent and specific notice of its infringement at least since April 24, 2024, by communications between GSK and Defendants. *See* Exhibits 81-82.

148. Defendants' infringement of the '694 patent has been and continues to be willful and deliberate at least since they received specific notice of their infringement from GSK on April 24, 2024. *See id.*

149. Defendants' conduct in infringing the '694 patent makes this case exceptional under 35 U.S.C. § 285.

COUNT III

(Infringement of the '534 Patent)

150. GSK incorporates by reference paragraphs 1–149.

151. GSK Biologicals is the lawful owner by assignment of the '534 patent, which is entitled "Methods of Administering Lipid Formulations with Viral Immunogens" and was duly and legally issued by the U.S. Patent and Trademark Office on June 6, 2023. A true and correct copy of the '534 patent is attached as Exhibit 3. The patent application issuing into the '534 patent was published on April 28, 2022, as Publication No. US 2022/0125727 A1. *See* Exhibit 3 at Prior Publication Data.

152. Each claim of the '534 patent is valid and enforceable.

153. Defendants have induced, and continue to induce, direct infringement by third parties of one or more claims of the '534 patent under 35 U.S.C. § 271(b), either literally or under the doctrine of equivalents, by making, selling and/or offering for sale in the United States, and/or importing into the United States, each of the Comirnaty® (original monovalent), Comirnaty®

(bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products embodying GSK Biologicals's patented inventions as disclosed by and claimed in the '534 patent, without authority or license to do so, during the term of the '534 patent.

154. In addition or in the alternative, Defendants have contributed, and continue to contribute, to the direct infringement by third parties of one or more claims of the '534 patent under 35 U.S.C. § 271(c), either literally or under the doctrine of equivalents, by making, selling and/or offering for sale in the United States, and/or importing into the United States, each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products embodying GSK Biologicals's patented inventions as disclosed by and claimed in the '534 patent, without authority or license to do so, during the term of the '534 patent, knowing that those products constitute a material part of the inventions of the '534 patent, knowing that those products are especially made or adapted to infringe the '534 patent, and knowing that those products are not staple articles or commodities of commerce suitable for substantial non-infringing use.

155. For example, on information and belief, the FDA authorized and approved uses for each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products satisfies each and every element of at least claim 1 of the '534 patent. Defendants' actions with respect to each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products have therefore infringed at least this exemplary claim of the '534 patent.

156. Claim 1 of the '534 patent recites:

> A method of eliciting an immune response against an immunogen in a subject, the method comprising:
>
> administering to the subject an immunologically effective unit dose of a formulation comprising:

> ribonucleic acid (RNA) molecules comprising a sequence that encodes the immunogen, wherein the immunogen comprises a respiratory syncytial virus immunogen, an Epstein-Barr virus immunogen, a cytomegalovirus immunogen, a coronavirus spike polypeptide immunogen, an influenza virus A immunogen, a Varicella zoster virus immunogen, or a flavivirus immunogen; and
>
> lipids comprising a tertiary amine cationic lipid, a polyethylene glycol-conjugated (PEG-conjugated) lipid, and cholesterol;
>
> wherein the lipids encapsulate at least half of the RNA molecules; and
>
> wherein the immune response against the immunogen comprises an antibody response against the immunogen.

157. Each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products comprises a "formulation." *See* paragraphs 47–66, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("The nucleoside-modified mRNA in COMIRNATY is formulated in lipid particles[.]"); Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 58 ("The nucleoside-modified messenger RNA in the vaccine is formulated in lipid nanoparticles[.]").

158. Each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products comprises "ribonucleic acid (RNA) molecules comprising a sequence that encodes [an] immunogen, wherein the immunogen comprises … a coronavirus spike polypeptide immunogen." *See* paragraphs 47–66, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("COMIRNATY … contains 30 mcg of a nucleoside-modified messenger RNA (mRNA) encoding the viral spike glycoprotein of SARS-CoV-2."); Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 15 ("The active substance consists of … mRNA that is translated into a codon-optimized sequence encoding the spike antigen of SARS-CoV-2[.]").

159. Each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products comprises "lipids comprising a tertiary amine cationic lipid, a polyethylene glycol-conjugated (PEG-conjugated) lipid, and cholesterol." *See* paragraphs 47–66, above, *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 (identifying lipid ingredients).

160. ALC-0315 is a "tertiary amine cationic lipid." *See*, *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 23–24 ("The ALC-0315 novel excipient is a cationic lipid containing a tertiary amine …."); Exhibit 71 (ALC-0315 Product Information, Cayman Chemical) (providing structure); Exhibit 72 (Schoenmaker *et al*., "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability," *Intl. J. Pharm.* 601, 120586 (2021)) at Fig. 6 (providing structure and identifying ALC-0315 as an "[i]onizable cationic lipid").

161. ALC-0159 is a "polyethylene glycol-conjugated (PEG-conjugated) lipid." *See*, *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 24 ("The ALC-0159 novel excipient is PEGylated lipid …."); Exhibit 74 (ALC-0159 Product Information, Echelon Biosciences) ("ALC-0159 is a PEGylated lipid which has been used to form lipid nanoparticles for delivery of RNA. ALC-0159 is one of the components in the BNT162b2 vaccine[.]"); Exhibit 72 (Schoenmaker *et al*., "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability," *Intl. J. Pharm.* 601, 120586 (2021)) at Fig. 6 (identifying ALC-0159 to be a "PEG-lipid").

162. On information and belief, the lipids of each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products "encapsulate at least half of the mRNA molecules." *See* paragraphs 47–66, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("The nucleoside-

modified mRNA in COMIRNATY is formulated in lipid particles, which enable delivery of the mRNA into host cells to allow expression of the SARS-CoV-2 antigen."); *see also* Exhibit 72 (Schoenmaker *et al.*, "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability," *Intl. J. Pharm.* 601, 120586 (2021)) at 4 ("In mRNA-LNP formulations, such as those used in mRNA vaccines ... encapsulation efficiencies ... are typically > 90%.").

163. Use of each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in accordance with the FDA authorized and approved indications comprises "administering to the subject an immunologically effective unit dose" that "elicit[s] an immune response" against "a coronavirus spike polypeptide immunogen" comprising "an antibody response against the immunogen." *See* paragraphs 47–90, above; *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® original Assessment Report) at 58 ("The vaccine elicits both neutralizing antibody and cellular immune responses to the spike (S) antigen, which may contribute to protection against COVID-19."); Exhibit 25 (November 4, 2022, Pfizer press release) ("Among the overall study population who received the Omicron BA.4/BA.5-adapted bivalent vaccine, there was a substantially higher increase in Omicron BA.4/BA.5-neutralizing antibody titers compared to pre-booster levels."); Exhibit 64 (September 11, 2023, FDA Comirnaty® (monovalent XBB.1.5) EUA Review Memo) at 17–18 (extrapolating immunological response from the prior Comirnaty® COVID-19 vaccine products and stating, "preclinical data demonstrate that, when compared with the Pfizer-BioNTech COVID-19 Vaccine, Bivalent (Original and Omicron BA.4/BA.5), Pfizer-BioNTech COVID-19 Vaccine (2023-2024 Formula) induces higher neutralizing antibody titers against XBB sublineages, including XBB.1.5, XBB.1.16, XBB.1.16.1, and XBB.2.3.").

164. Defendants packaged, promoted, and sold, and continue to package promote and sell, each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States with FDA-approved packaging and package inserts comprising labeling and prescribing information that instruct health care practitioners on their use in accordance with the FDA authorized and approved indications. *See* paragraphs 47–90, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert); Exhibit 35 (July 14, 2023, FDA Comirnaty® (bivalent BA.4/5) EUA Fact Sheet and Package Insert); Exhibit 33 (September 2023, FDA Comirnaty® (monovalent XBB.1.5) Package Insert).

165. Defendants created and disseminated, and continue to create and disseminate, by means separate from the packaging and package inserts of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products, supporting materials, instructions, and/or technical information that instruct health care practitioners on the use of each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States in accordance with the FDA authorized and approved indications. *See*, *e.g.*, Exhibit 78 (www.comirnaty.com as preserved by The Wayback Machine, August, 27, 2021[15]); Exhibit 79 (www.comirnaty.com/eua-bivalent as preserved by The Wayback Machine, September, 22, 2022[16]); Exhibit 80 (www.comirnaty.com/eua-six-months-to-eleven-years; preserved April 5, 2024).

[15] Available at https://web.archive.org/web/20210827220339/https://www.comirnaty.com/; preserved on April 5, 2024.
[16] Available at https://web.archive.org/web/20220922181232/https://www.comirnaty.com/eua-bivalent; preserved on April 5, 2024.

166. Defendants have been and are aware that the use of each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States in accordance with the FDA authorized and approved indications identified above in paragraphs 67–90 infringes at least exemplary claim 1 of the '534 patent.

167. Defendants have been and are aware that healthcare providers use each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States in accordance with the FDA authorized and approved indications identified above in paragraphs 67–90 and thereby infringe at least exemplary claim 1 of the '534 patent.

168. None of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products is a staple article or commodity of commerce suitable for use in the United States other than in accordance with the FDA authorized and approved indications identified above in paragraphs 67–90.

169. Defendants actively, knowingly, and specifically intended to induce, and induced, and continue to actively, knowingly, and specifically intend to induce, and induce, infringement of at least claim 1 of the '534 patent by packaging, promoting, selling or otherwise supplying, directly or indirectly, each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products to healthcare providers, with the knowledge and intent that healthcare providers will use the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products supplied by Defendants according to the FDA authorized and approved infringing indications.

170. GSK has suffered and continues to suffer damages from Defendants' infringement of the '534 patent.

171. GSK is entitled to an award of monetary damages, including a reasonable royalty, for Defendants' infringement of the '534 patent.

172. Defendants have had knowledge of the '534 patent and specific notice of its infringement at least since April 24, 2024, by communications between GSK and Defendants. *See* Exhibits 81-82.

173. Defendants' infringement of the '534 patent has been and continues to be willful and deliberate at least since they received specific notice of their infringement from GSK on April 24, 2024. *See id.*

174. Defendants' conduct with respect to the '534 patent makes this case exceptional under 35 U.S.C. § 285.

COUNT IV

(Infringement of the '401 Patent)

175. GSK incorporates by reference paragraphs 1–174.

176. GSK Biologicals is the lawful owner by assignment of the '401 patent, which is entitled "Methods of Administering Lipid Formulations with Immunogens" and was duly and legally issued by the U.S. Patent and Trademark Office on September 26, 2023. A true and correct copy of the '401 patent is attached as Exhibit 4. The patent application issuing into the '401 patent was published on April 28, 2022, as Publication No. US 2022/0125724 A1. *See* Exhibit 4 at Prior Publication Data.

177. Each claim of the '401 patent is valid and enforceable.

178. Defendants have induced, and continue to induce, direct infringement by third parties of one or more claims of the '401 patent under 35 U.S.C. § 271(b), either literally or under the doctrine of equivalents, by making, selling and/or offering for sale in the United States, and/or importing into the United States, each of the Comirnaty® (original monovalent), Comirnaty®

(bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products embodying GSK Biologicals's patented inventions as disclosed by and claimed in the '401 patent, without authority or license to do so, during the term of the '401 patent.

179. In addition or in the alternative, Defendants have contributed, and continue to contribute, to the direct infringement by third parties of one or more claims of the '401 patent under 35 U.S.C. § 271(c), either literally or under the doctrine of equivalents, by making, selling and/or offering for sale in the United States, and/or importing into the United States, each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products embodying GSK Biologicals's patented inventions as disclosed by and claimed in the '401 patent, without authority or license to do so, during the term of the '401 patent, knowing that those products constitute a material part of the inventions of the '401 patent, knowing that those products are especially made or adapted to infringe the '401 patent, and knowing that those products are not staple articles or commodities of commerce suitable for substantial non-infringing use.

180. For example, on information and belief, the FDA authorized and approved uses for each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products satisfies each and every element of at least claim 1 of the '401 patent. Defendants' actions with respect to each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products have therefore infringed at least this exemplary claim of the '401 patent.

181. Claim 1 of the '401 patent recites:

> A method of eliciting an immune response against an immunogen in a human or a cow, the method comprising:
>
> administering to the human or the cow an immunologically effective unit dose of a formulation comprising:

> RNA molecules comprising a sequence that encodes the immunogen; and
>
> lipids comprising a tertiary amine cationic lipid, a polyethylene glycol-conjugated (PEG-conjugated) lipid, and cholesterol; and
>
> wherein the lipids encapsulate at least half of the RNA molecules; and the immune response against the immunogen comprises an antibody response against the immunogen.

182. Each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products comprises a "formulation." *See* paragraphs 47–66, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("The nucleoside-modified mRNA in COMIRNATY is formulated in lipid particles[.]"); Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 58 ("The nucleoside-modified messenger RNA in the vaccine is formulated in lipid nanoparticles[.]").

183. Each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products comprises "RNA molecules comprising a sequence that encodes [an] immunogen." *See* paragraphs 47–66, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("COMIRNATY … contains 30 mcg of a nucleoside-modified messenger RNA (mRNA) encoding the viral spike glycoprotein of SARS-CoV-2."); Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 15 ("The active substance consists of … mRNA that is translated into a codon-optimized sequence encoding the spike antigen of SARS-CoV-2[.]").

184. Each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products comprises "lipids comprising a tertiary amine cationic lipid, a polyethylene glycol-conjugated (PEG-conjugated) lipid, and cholesterol." *See*

paragraphs 47–66, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 (identifying lipid ingredients).

185. ALC-0315 is a "tertiary amine cationic lipid." *See*, *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 23–24 ("The ALC-0315 novel excipient is a cationic lipid containing a tertiary amine …."); Exhibit 71 (ALC-0315 Product Information, Cayman Chemical) (providing structure); Exhibit 72 (Schoenmaker *et al*., "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability," *Intl. J. Pharm.* 601, 120586 (2021)) at Fig. 6 (providing structure and identifying ALC-0315 as an "[i]onizable cationic lipid").

186. ALC-0159 is a "polyethylene glycol-conjugated (PEG-conjugated) lipid." *See*, *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 24 ("The ALC-0159 novel excipient is PEGylated lipid …."); Exhibit 74 (ALC-0159 Product Information, Echelon Biosciences) ("ALC-0159 is a PEGylated lipid which has been used to form lipid nanoparticles for delivery of RNA. ALC-0159 is one of the components in the BNT162b2 vaccine[.]"); Exhibit 72 (Schoenmaker *et al*., "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability," *Intl. J. Pharm.* 601, 120586 (2021)) at Fig. 6 (identifying ALC-0159 to be a "PEG-lipid").

187. On information and belief, the lipids of each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products "encapsulate at least half of the mRNA molecules." *See* paragraphs 47–66, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("The nucleoside-modified mRNA in COMIRNATY is formulated in lipid particles, which enable delivery of the mRNA into host cells to allow expression of the SARS-CoV-2 antigen."); *see also* Exhibit 72 (Schoenmaker *et al*., "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability,"

Intl. J. Pharm. 601, 120586 (2021)) at 4 ("In mRNA-LNP formulations, such as those used in mRNA vaccines ... encapsulation efficiencies ... are typically > 90%.").

188. Use of each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in accordance with the FDA authorized or approved uses comprises "administering to [a] human … an immunologically effective unit dose" that "elicit[s] an immune response" against a coronavirus spike polypeptide "immunogen" comprising "an antibody response against the immunogen." *See* paragraphs 47–90, above; *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 58 ("The vaccine elicits both neutralizing antibody and cellular immune responses to the spike (S) antigen, which may contribute to protection against COVID-19."); Exhibit 25 (November 4, 2022, Pfizer press release) ("Among the overall study population who received the Omicron BA.4/BA.5-adapted bivalent vaccine, there was a substantially higher increase in Omicron BA.4/BA.5-neutralizing antibody titers compared to pre-booster levels."); Exhibit 64 (September 11, 2023, FDA Comirnaty® (monovalent XBB.1.5) EUA Review Memo) at 17–18 (extrapolating immunological response from the prior Comirnaty® COVID-19 vaccine products and stating, "preclinical data demonstrate that, when compared with the Pfizer-BioNTech COVID-19 Vaccine, Bivalent (Original and Omicron BA.4/BA.5), Pfizer-BioNTech COVID-19 Vaccine (2023-2024 Formula) induces higher neutralizing antibody titers against XBB sublineages, including XBB.1.5, XBB.1.16, XBB.1.16.1, and XBB.2.3.").

189. Defendants packaged, promoted, and sold, and continue to package promote and sell, each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States with FDA-approved packaging and package inserts comprising labeling and prescribing information that instruct health care

practitioners on their use in accordance with the FDA authorized and approved indications. *See* paragraphs 47–90, above; *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert); Exhibit 35 (July 14, 2023, FDA Comirnaty® (bivalent BA.4/5) EUA Fact Sheet and Package Insert); Exhibit 33 (September 2023, FDA Comirnaty® (monovalent XBB.1.5) Package Insert).

190. Defendants created and disseminated, and continue to create and disseminate, by means separate from the packaging and package inserts of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products, supporting materials, instructions, and/or technical information that instruct health care practitioners on the use of each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States in accordance with the FDA authorized and approved indications. *See*, *e.g.*, Exhibit 78 (www.comirnaty.com as preserved by The Wayback Machine, August, 27, 2021[17]); Exhibit 79 (www.comirnaty.com/eua-bivalent as preserved by The Wayback Machine, September, 22, 2022[18]); Exhibit 80 (www.comirnaty.com/eua-six-months-to-eleven-years; preserved April 5, 2024).

191. Defendants have been and are aware that the use of each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States in accordance with the FDA authorized and approved indications identified above in paragraphs 67–90 infringes at least exemplary claim 1 of the ’401 patent.

[17] Available at https://web.archive.org/web/20210827220339/https://www.comirnaty.com/; preserved on April 5, 2024.
[18] Available at https://web.archive.org/web/20220922181232/https://www.comirnaty.com/eua-bivalent; preserved on April 5, 2024.

192. Defendants have been and are aware that healthcare providers use each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States in accordance with the FDA authorized and approved indications identified above in paragraphs 67–90 and thereby infringe at least exemplary claim 1 of the '401 patent.

193. None of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products is a staple article or commodity of commerce suitable for use in the United States other than in accordance with the FDA authorized and approved indications identified above in paragraphs 67–90.

194. Defendants actively, knowingly, and specifically intended to induce, and induced, and continue to actively, knowingly, and specifically intend to induce, and induce, infringement of at least claim 1 of the '401 patent by packaging, promoting, selling or otherwise supplying, directly or indirectly, each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products to healthcare providers, with the knowledge and intent that healthcare providers will use the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products supplied by Defendants according to the FDA authorized and approved infringing indications.

195. GSK has suffered and continues to suffer damages from Defendants' infringement of the '401 patent.

196. GSK is entitled to an award of monetary damages, including a reasonable royalty, for Defendants' infringement of the '401 patent.

197. Defendants have had knowledge of the '401 patent and specific notice of its infringement at least since April 24, 2024, by communications between GSK and Defendants. *See* Exhibits 81-82.

198. Defendants' infringement of the '401 patent has been and continues to be willful and deliberate at least since they received specific notice of their infringement from GSK on April 24, 2024. *See id.*

199. Defendants' conduct with respect to the '401 patent makes this case exceptional under 35 U.S.C. § 285.

COUNT V

(Infringement of the '467 Patent)

200. GSK incorporates by reference paragraphs 1–199.

201. GSK Biologicals is the lawful owner by assignment of the '467 patent, which is entitled "Lipid Formulations with Immunogens" and was duly and legally issued by the U.S. Patent and Trademark Office on October 17, 2023. A true and correct copy of the '467 patent is attached as Exhibit 5. The patent application issuing into the '467 patent was published on April 28, 2022, as Publication No. US 2022/0125722 A1. *See* Exhibit 5 at Prior Publication Data.

202. Each claim of the '467 patent is valid and enforceable.

203. Defendants have directly infringed and continue to directly infringe one or more claims of the '467 patent under 35 U.S.C. § 271(a), either literally or under the doctrine of equivalents, by making, using, offering to sell, or selling, within the United States, or importing into the United States, each of the Accused Products embodying GSK Biologicals's patented inventions as disclosed by and claimed in the '467 patent, without authority or license to do so, during the term of the '467 patent.

204. In addition or in the alternative, Defendants have induced, and continue to induce, direct infringement by third parties of one or more claims of the '467 patent under 35 U.S.C. § 271(b), either literally or under the doctrine of equivalents, by making, selling and/or offering for sale in the United States, and/or importing into the United States, each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products embodying GSK Biologicals's patented inventions as disclosed by and claimed in the '467 patent, without authority or license to do so, during the term of the '467 patent.

205. In addition or in the alternative, Defendants have contributed, and continue to contribute, to the direct infringement by third parties of one or more claims of the '467 patent under 35 U.S.C. § 271(c), either literally or under the doctrine of equivalents, by making, selling and/or offering for sale in the United States, and/or importing into the United States, each of the Accused Products embodying GSK Biologicals's patented inventions as disclosed by and claimed in the '467 patent, without authority or license to do so, during the term of the '467 patent, knowing that those products constitute a material part of the inventions of the '467 patent, knowing that those products are especially made or adapted to infringe the '467 patent, and knowing that those products are not staple articles or commodities of commerce suitable for substantial non-infringing use.

206. For example, on information and belief, each of the Accused Products satisfies each and every element of at least claim 1 of the '467 patent. Defendants' actions with respect to each of the Accused Products have therefore infringed at least this exemplary claim of the '467 patent.

207. Claim 1 of the '467 patent recites:

> A formulation comprising:
>
> ribonucleic acid (RNA) molecules comprising a sequence that encodes an immunogen; and

> lipids comprising a tertiary amine cationic lipid, a polyethylene glycol-conjugated (PEG-conjugated) lipid, and cholesterol;
>
> wherein the formulation is immunogenic in vivo by eliciting an antibody response against the immunogen in vivo;
>
> wherein the lipids encapsulate at least half of the RNA molecules.

208. Each of the Accused Products comprises a "formulation." *See* paragraphs 47–66, above at, *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("The nucleoside-modified mRNA in COMIRNATY is formulated in lipid particles[.]"); Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 58 ("The nucleoside-modified messenger RNA in the vaccine is formulated in lipid nanoparticles[.]").

209. Each of the Accused Products comprises "ribonucleic acid (RNA) molecules comprising a sequence that encodes an immunogen." *See* paragraphs 47–66, above at, *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("COMIRNATY … contains 30 mcg of a nucleoside-modified messenger RNA (mRNA) encoding the viral spike glycoprotein of SARS-CoV-2."); Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 15 ("The active substance consists of … mRNA that is translated into a codon-optimized sequence encoding the spike antigen of SARS-CoV-2[.]").

210. Each of the Accused Products comprises "lipids comprising a tertiary amine cationic lipid, a polyethylene glycol-conjugated (PEG-conjugated) lipid, and cholesterol." *See* paragraphs 47–66, above at, *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 (identifying lipid ingredients).

211. ALC-0315 is a "tertiary amine cationic lipid." *See*, *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 23–24 ("The ALC-0315 novel excipient is a cationic lipid containing a tertiary amine …."); Exhibit 71 (ALC-0315 Product

Information, Cayman Chemical) (providing structure); Exhibit 72 (Schoenmaker *et al*., "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability," *Intl. J. Pharm.* 601, 120586 (2021)) at Fig. 6 (providing structure and identifying ALC-0315 as an "[i]onizable cationic lipid").

212. ALC-0159 is a "polyethylene glycol-conjugated (PEG-conjugated) lipid." *See*, *e.g.*, Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 24 ("The ALC-0159 novel excipient is PEGylated lipid …."); Exhibit 74 (ALC-0159 Product Information, Echelon Biosciences) ("ALC-0159 is a PEGylated lipid which has been used to form lipid nanoparticles for delivery of RNA. ALC-0159 is one of the components in the BNT162b2 vaccine[.]"); Exhibit 72 (Schoenmaker *et al*., "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability," *Intl. J. Pharm.* 601, 120586 (2021)) at Fig. 6 (identifying ALC-0159 to be a "PEG-lipid").

213. Each of the Accused Products is "is immunogenic in vivo by eliciting an antibody response against the immunogen in vivo" at least when used in accordance with the FDA and EMA authorized and approved indications. *See* paragraphs 47–90, above at, *e.g*., Exhibit 21 (February 19, 2021, EMA Comirnaty® (original monovalent) Assessment Report) at 58 ("The vaccine elicits both neutralizing antibody and cellular immune responses to the spike (S) antigen, which may contribute to protection against COVID-19."); Exhibit 24 (September 1, 2022, Pfizer press release) ("[T]he bivalent vaccine with mRNA encoding the wild-type and the BA.1 spike proteins provides [] neutralizing antibody titers against the Omicron BA.1 and BA.4/BA.5 sublineages[.]"); Exhibit 25 (November 4, 2022, Pfizer press release) ("Among the overall study population who received the Omicron BA.4/BA.5-adapted bivalent vaccine, there was a substantially higher increase in Omicron BA.4/BA.5-neutralizing antibody titers compared to pre-booster levels."); Exhibit 64 (September 11, 2023, FDA Comirnaty® (monovalent XBB.1.5) EUA Review Memo) at 17–18

(extrapolating immunological response from the prior Comirnaty® COVID-19 vaccine products and stating, "preclinical data demonstrate that, when compared with the Pfizer-BioNTech COVID-19 Vaccine, Bivalent (Original and Omicron BA.4/BA.5), Pfizer-BioNTech COVID-19 Vaccine (2023-2024 Formula) induces higher neutralizing antibody titers against XBB sublineages, including XBB.1.5, XBB.1.16, XBB.1.16.1, and XBB.2.3.").

214. On information and belief, the lipids of each of the Accused Products "encapsulate at least half of the RNA molecules." *See* paragraphs 47–66, above at, *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert) at 19 ("The nucleoside-modified mRNA in COMIRNATY is formulated in lipid particles, which enable delivery of the mRNA into host cells to allow expression of the SARS-CoV-2 antigen."); *see also* Exhibit 72 (Schoenmaker *et al*., "mRNA-lipid nanoparticle COVID-19 vaccines: Structure and Stability," *Intl. J. Pharm.* 601, 120586 (2021)) at 4 ("In mRNA-LNP formulations, such as those used in mRNA vaccines ... encapsulation efficiencies ... are typically > 90%.").

215. Defendants packaged, promoted, and sold, and continue to package promote and sell, each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States with FDA-approved packaging and package inserts comprising labeling and prescribing information that instruct health care practitioners on their use in accordance with the FDA authorized and approved indications. *See* paragraphs 47–90, above at, *e.g.*, Exhibit 34 (April 2023, FDA Comirnaty® (original monovalent) Package Insert); Exhibit 35 (July 14, 2023, FDA Comirnaty® (bivalent BA.4/5) EUA Fact Sheet and Package Insert); Exhibit 33 (September 2023, FDA Comirnaty® (monovalent XBB.1.5) Package Insert).

216. Defendants created and disseminated, and continue to create and disseminate, by means separate from the packaging and package inserts of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products, supporting materials, instructions, and/or technical information that instruct health care practitioners on the use of each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States in accordance with the FDA authorized and approved indications. *See*, *e.g.*, Exhibit 78 (www.comirnaty.com as preserved by The Wayback Machine, August, 27, 2021[19]); Exhibit 79 (www.comirnaty.com/eua-bivalent as preserved by The Wayback Machine, September, 22, 2022[20]); Exhibit 80 (www.comirnaty.com/eua-six-months-to-eleven-years; preserved April 5, 2024).

217. Defendants have been and are aware that the use of each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States in accordance with the FDA authorized and approved indications identified above in paragraphs 67–90 infringes at least exemplary claim 1 of the '467 patent.

218. Defendants have been and are aware that healthcare providers use each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products in the United States in accordance with the FDA authorized and approved indications identified above in paragraphs 67–90 and thereby infringe at least exemplary claim 1 of the '467 patent.

[19] Available at https://web.archive.org/web/20210827220339/https://www.comirnaty.com/; preserved on April 5, 2024.
[20] Available at https://web.archive.org/web/20220922181232/https://www.comirnaty.com/eua-bivalent; preserved on April 5, 2024.

219. None of the Accused Products is a staple article or commodity of commerce suitable for use in the United States other than in accordance with the FDA authorized and approved indications identified above in paragraphs 67–90.

220. Defendants actively, knowingly, and specifically intended to induce, and induced, and continue to actively, knowingly, and specifically intend to induce, and induce, infringement of at least claim 1 of the '467 patent by packaging, promoting, selling or otherwise supplying, directly or indirectly, each of the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products to healthcare providers, with the knowledge and intent that healthcare providers will use the Comirnaty® (original monovalent), Comirnaty® (bivalent BA.4/5), and Comirnaty® (monovalent XBB.1.5) products supplied by Defendants according to the FDA authorized and approved infringing indications.

221. GSK has suffered and continues to suffer damages from Defendants' infringement of the '467 patent.

222. GSK is entitled to an award of monetary damages, including a reasonable royalty, for Defendants' infringement of the '467 patent.

223. Defendants have had knowledge of the '467 patent and specific notice of its infringement at least since April 24, 2024, by communications between GSK and Defendants. *See* Exhibits 81-82.

224. Defendants' infringement of the '467 patent has been and continues to be willful and deliberate at least since they received specific notice of their infringement from GSK on April 24, 2024. *See id.*

225. Defendants' conduct with respect to the '467 patent makes this case exceptional under 35 U.S.C. § 285.

PRAYER FOR RELIEF

WHEREFORE, GSK prays for judgment as follows:

A. That Defendants have directly infringed, either literally or under the doctrine of equivalents, at least one claim of each of the Patents-in-Suit;

B. That Defendants have induced infringement of at least one claim of each of the Patents-in-Suit;

C. That Defendants have contributorily infringed at least one claim of each of the Patents-in-Suit;

D. That Defendants' infringement of at least one claim of each of the Patents-in-Suit has been willful;

E. That GSK be awarded all damages adequate to compensate it for Defendants' infringement of the Patents-in-Suit, such damages to be determined by a jury, and if necessary to adequately compensate GSK for the infringement, an accounting, and that such damages be trebled and awarded to GSK with pre- and post-judgment interest;

F. That this case be declared an exceptional case within the meaning of 35 U.S.C. § 285 and that GSK be awarded the attorney fees, costs, and expenses incurred in connection with this action;

G. That GSK be awarded a compulsory ongoing licensing fee; and

H. That GSK be awarded such other and further relief at law or equity as this Court deems just and proper.

DEMAND FOR JURY TRIAL

GSK hereby demands a trial by jury on all issues so triable.

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